Pacific Seabird Group

BULLETIN

Volume 17 Number 1 1990

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PACIFIC SEABIRD GROUP

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THE CHAIR'S PAGE

Greetings! I would like to report on the recent activities of the Pacific Seabird Group and some future directions our Group can proceed. First, if you were unable to attend the Annual Meeting in Victoria, B.C., you missed a god one. We were very fortunate in having the Royal British Columbia Provincial Museum as our meeting site -- the work by the local committee and the museum staff made it a very enjoyable experience.

As you know, 1989 proved to be a quite important period for seabird conservation and biology. Probably the most notorious was the oilspill caused by the *Exxon Valdez* on March 24. As in so many environmental disasters, the causes are usually easy to identify but understanding the consequences is difficult. The Pacific Seabird Group is fortunate in that many of our members have the skills and opportunities to research the effects of this calamity and begin study on how to begin to set things right. Stan Senner organized a symposium directed at these topics and five groups presented papers at the Annual Meeting discussing the progress to date.

There is considerable interest in understanding the biology of Marbled Murrelets and the relationships of these furtive birds to old growth timber stands. The PSG's Marbled Murrelet study group, chaired by Lora Leschner organized a well-attended symposium on current research on Marbled Murrelets. It is becoming a little easier to identify potential nesting areas and some very keen-eyed people have discovered two more nests. This year's wok by murrelet biologists have increased our understanding of their behavior at the nest, the diet of chicks and adults, and other aspects of their biology. This research is increasing our knowledge of how these small seabirds related to habitats and areas coming under increasingly greater threat by development and logging.

The Museum helped us organize an evening program of speakers open to the public (and very well attended) who addressed various issues concerning environmental protection, past and current threats to seabirds and how the informed public can help. It was a very effective forum for discussing these complex issues, and I am proud that the Pacific Seabird Group was instrumental in its presentation. I would like to see more of these programs at subsequent annual meetings -- and other occasions.

The International scope of the Pacific Seabird Group was represented by the comprehensive symposium on seabirds of the North Pacific which was organized by Kees Vermeer, Ken Briggs, Stu Fefer, and myself. Talks on seabirds and habitats were presented by seabird biologists from many of the countries on the Pacific Rim, including Canada, Chile, China, Japan, Korea, Mexico, New Zealand, Soviet Union, and the U.S. The response by seabird biologists from these and other countries indicates to me the international appeal of seabird biology and the pivotal role that the Pacific Seabird Group plays in promoting conservation and basic research of these species. It is easy to predict that these types of international collaboration will only increase in the future and I invite members so interested in being involved in similar ventures to contact me. Someone among the international membership of the Pacific Seabird Group is waiting to hear from you!

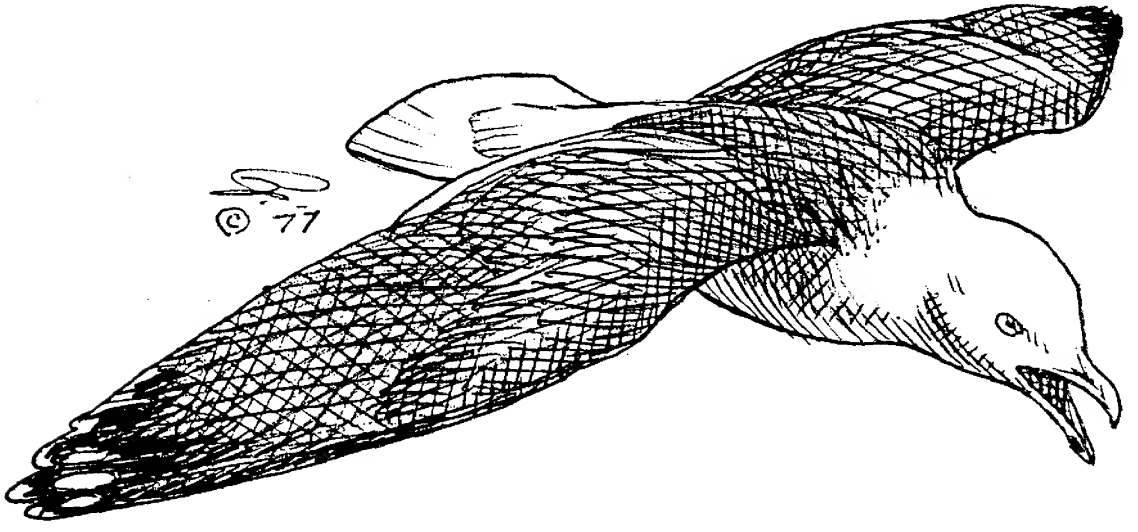
Our discussions with the Colonial Waterbird Society concerning the possibilities of a jointly published journal continue. It is clear to me

that the membership wants to support publication of a journal devoted to seabirds and we are fortunate in having several choices. Such an undertaking must demand considerable investment from the Pacific Seabird Group, both financial and effort, so the Executive Council is proceeding in a very deliberate manner. I invite any of you who have opinions -- positive or negative -- to write me and express them. They will help us to decide now to proceed further. One of the most telling things to come from the rather laborious effort in discussing the issues of publication was the repeated concern among the membership that the Pacific Seabird Group continue its strong advocacy in conservation.

The Pacific Seabird Group was founded as a group of amateurs and professionals interested in promoting research and conservation of seabirds. This dual nature has helped PSG to acquire and retain a distinctiveness that all of us want to nurture and intensify. Unlike scientific presentations, which fill up most of the printed part of the program and which have taken up much of my letter, conservation issues are discussed and acted upon among members, in person and throughout the activities of the Conservation Committee. In recognition of the increasing importance of seabird conservation, we plan to make this committee one of the few Permanent Committees in our group.

I wish you all a productive and profitable summer.

Douglas Siegel-Causey



PROPOSED MINUTES OF THE EXECUTIVE COUNCIL MEETING

The meeting convened 21 February 1990, Victoria, B.C., Canada

Mike Fry called the meeting to order at 1515. A quorum was present consisting of Mike Fry, Kim Nelson, Harry Carter, Beth Flint, Dan Anderson, Doug Forsell, Dough Siegel-Causey, Lora Leschner, Mark Tasker, C.J. Ralph, Kees Vermeer, Ken Brigs, Art Sowls, Scot Hatch, Joel Hubbard, George Divoky, Vivian Mendenhall, and Enriqueta Velarde.

1. Mike Fry read the minutes of the 1988 Executive Council meeting held in Washington, D.C. The minutes were APPROVED unanimously by the Council.

2. Art Sowls reported on the activities of the Conservation Committee. A brochure targeting information on Seabird Disturbance has been finished and an artist has been commissioned by the USFWS. The brochure will be sent out son for criticism and later printed.

An Oilspill Symposium has been organized and papers will read at this Annual Meeting. The Committee suggests that PSG inform interested parties about possible uses of any award money from the oilspill litigation. Such uses might include purchase of critical habitat, support of removal of introduced predators, and other related issues. Sowls introduced the question whether the Conservation Committee should be made an official Standing Committee. A motion was made to form an ad hoc committee composed of the PSG Chair, Chair-Elect, and Conservation Committee Chairman to write the necessary changes to the By-laws and to formalize the structure and activities of the Conservation Committee. The motion was SECONDED and PASSED

3. Mike Fry read the report from Judith Hand concerning the activities of the Fundraising Committee. Sale of T-shirts continues to increase the Endowment, but other activities should be organized to bring in more money. Judith regrets that she is resigning Chairmanship of the committee. The Council expressed gratitude for Judith's efforts and energy. A motion nominating Mike Fry as Chairman of the Fundraising Committee was SECONDED and PASSED.

4. Mike Fry reported that the Nomination Committee did not operate normally last year because a replacement for Palmer Sekora had not been found yet. A motion nominating Doug Forsell as Chairman of the Election Committee was later SECONDED and PASSED.

5. Lora Leschner reported that the Marbled Murrelet Technical Group had completed their stated activities culminating in a symposium held at this Annual Meeting. She proposed that further activities concerning this species should be transferred to the Conservation Committee. This motion was SECONDED and PASSED.

6. George Divoky reported on the activities of the Historian. He noted that the program cover of the Annual Meeting differed from previous years in that the PSG logo was missing. Otherwise, there was a small amount of history last year. The Historian's report was APPROVED by the Council.

7. Mike Fry proposed that journals sent to PSG en exchange for the bulletin be deposited at the Western Foundation o Vertebrate Zoology, Los Angeles, in return for their help in processing sales of back issues. A motion supporting this was SECONDED and PASSED.

8. Doug Siegel-Causey proposed that an Ad Hoc Student Award Committee be formed to evaluate student talks and that a suitable award by found. The motion was SECONDED and PASSED.

9. Ellen Chu gave the treasurer's report which was APPROVED by the Council. [The treasurer's Report is presented below.]

10. Mike Fry read the Editor's report from Malcolm Coulter. Volume 16 of the Bulletin was completed and mailed to the membership. Number 1 was mailed in early June and Number 2 was mailed in December. This was later than expected. The main problem in the delay has been in receiving material late. Malcolm has written to the Regional Representatives before the deadlines, but only a few have been getting this to him on time. Malcolm notes that he is nearing the end of a five-year term and feels that it is time to pass the responsibilities on to someone else. He will do the next issue, but would like the new Editor to take responsibility for Volume 17, Number 2. The Editor's report was APPROVED by the Council.

11. Mike Fry read the ICBP report from Malcolm Coulter. In 1988, the USFWS prepared a draft document on its Nongame Bird Strategy. It was very rough and they requested comments. At the last PSG meeting, he was given responsibility to comment on this for PSG. Malcolm wrote to members of the Council for advice and individual comments, and later compiled a consensus of views. This document was passed on to USFWS who have apparently rewritten the Strategy report, but it has not been seen. the U.S. Government Accounting Office has reviewed the USFWS and National Marine Fisheries Service's record on endangered species. It was not complementary. the report is available from the GAO, Washington, D.C. 20548. The ICBP report was APPROVED by the Council.

12. The Executive Council entered into extensive debate concerning the issues of jointly publishing a journal with the Colonial Waterbird Society. Herb Kale presented motions of the Executive Council of the CWBS that empowered him to begin negotiations with PSG and that laid out necessary conditions for creation of a joint Editorial Board for *Colonial Waterbirds*. The Council felt that there were several collateral issues that had to be resolved before formal negotiations could proceed.

Ellen Chu moved that a Committee be formed to examine the publication of the PSG Bulletin and to suggest possible changes to format. She further moved that the Committee be composed of the Treasurer, the Chair-elect, and C. J. Ralph. The motion was SECONDED and PASSED.

The Council came to consensus informally on the several issues relating to desirability of joint publication with the CWBS. As a result, Mike Fry moved that a Negotiating committee be formed to deal with four issues: (a) possible name change of the journal; (b) editorial responsibility; (c) capital outlay by PSG to CWBS (or the Editorial Board of the journal); (d) possible change in logo for the journal. He further moved that the Committee be composed of the Treasurer, the Chair-elect, Beth Flint, Ken Brigs, Scot Hatch, and C. J. Ralph. The motion was SECONDED and PASSED.

The Council directed the Negotiation Committee to discuss these issues and prepare an agenda of issues to discuss with the CWBS Editorial Board at their next Annual Meeting. Mike Fry moved that PSG send the current Chair to that Annual Meeting to present the considerations of the committee. The motion was SECONDED and PASSED.

13. Several locations were suggested for the site of the next Annual Meeting. dough Siegel-Causey suggested that possible sites for future Annual Meetings be found at this meeting to provide for easier planning. the Council directed him to compile a list of possible sites. Ken Briggs noted that the Convention Bureau of Monterey, California was well-equipped to undertake planning for our Annual Meeting. Mike Fry moved that the next Annual Meeting be held in the Monterey area, that it be in early January, and that Ken Briggs, or his designate, be in charge of a Local Committee to begin planning. the motion was SECONDED and PASSED.

The Council adjourned at 2200 and reconvened at 1020, 24 February.

14. there was further discussion concerning the joint publication and the mandate of the Negotiating Committee. The Council was concerned about the yet unknown costs to PSG in terms of capital outlay, dues increase, and continuing financial support of publication. After considerable discussion, the Council gave the Committee the following directives: (a) arrive at three possible names for the jointly published journal; (b) decide upon acceptable limits for prorated costs and financial support of the journal; (c) devise a possible composition of the joint Editorial Board; (d) present all findings to the Council for approval prior to submission to CWBS. The directives were considered to be more explicit findings of the previously passed motion.

15. the chairman of the Nominations Committee reported that Mike Fry and George Divoky had agreed to serve and that nominations would be presented to the membership for election as soon as possible.

16. Mike Fry welcomed Doug Siegel-Causey as the incoming Chair of the Pacific Seabird Group. He moved that the Council meeting be adjourned; it was SECONDED and PASSED. The meeting was adjourned at 1145.

TREASURER'S REPORT, 1989

CARRYOVER FROM 1988			
Treasurer's checking acct.	$576.39		
Bulletin checking acct.	$1,542.47		
UK account	$193.00		
Savings	$3,329.25		
Endowment (as of 12/31/88)	$17,813.22		
Total carryover			$23,454.33
1989 INCOME			
Dues $6,700.00			
Donations	$115.00		
Interest on savings	$634.31		
Interest on endowment	$1,900.19		
Misc. income (incl. interest on chkg)	$62.94		
Total income			$9,412.44
1989 EXPENSES			
Bulletin and related costs	$799.34		
Officers' (supplies, postage, etc.)	$340.18		
ICBP dues	$200.00		
Total expenses			($1,339.52)
1989 INCOME OVER EXPENSES			$8,072.92
ACCOUNT BALANCES			
Main checking (as of 12/31/89)	$1,362.04		
Bulletin acct. (as of 12/31/89)	$806.07		
UK acct. (@ 1 pound = $1.50)	$330.00	(£ 220)	
Savings (as of 12/31/89)	$10,463.56		
Endowment (as of 12/31/89)	$21,977.61		
Total assets			$34,939.28

Income

As usual, the bulk of our income in 1989 came from membership dues, including life memberships. Unlike regular memberships, which become part of PSG's yearly cash flow, life membership dues are deposited directly into the Endowment Fund, which cannot be touched until 1991. In 1989 PSG received $4,230.00 in regular memberships and $2,470.00 in life memberships. All donations received in 1989 were unsolicited; there was no income from T-shirt sales or other fund-raising activities.

Expenses

PSG incurred few expenses in 1989, particularly since we did not hold an annual meeting this year. Officer's expenses were about half of what they were in 1988--in part, unfortunately, because elections were never held (reducing postage). The figure for Bulletin costs is low because the Savannah River Ecology Lab has effectively been covering some of our basic costs. In its current form, the Bulletin costs a little more than $3,000.00 per annual volume to print and mail.

Endowment Fund

The endowment fund is in the form of US Government Securities, brokered through Dean-Witter Reynolds. At the end of 1989, PSG owned 2,311 shares at a market value of $9.51 per share (compared with 1,891 shares at $9.42 per share in December 1988). Donations, as well as life memberships, are deposited directly into this fund.

Membership

As of 1989, "current members" are defined as those who have paid their dues for a given year before the first issue of that year's Bulletin has been mailed. Forgetful members can rejoin at any time, but only current members will receive the Bulletin. At the end of 1989, PSG had 230 members who were paid through 1990 or later (compared with about 290 current members in 1988) and another 94 members who were paid through 1989. In addition, 60 institutions worldwide receive the PSG Bulletin, of which 26 are paid subscriptions and the rest are journal exchanges or goodwill gifts. (As this issue went to press, we had 278 current members of whom about 30 were new, including some who joined at the February meeting in Victoria.)

PSG SEABIRD COLONY COMMITTEE

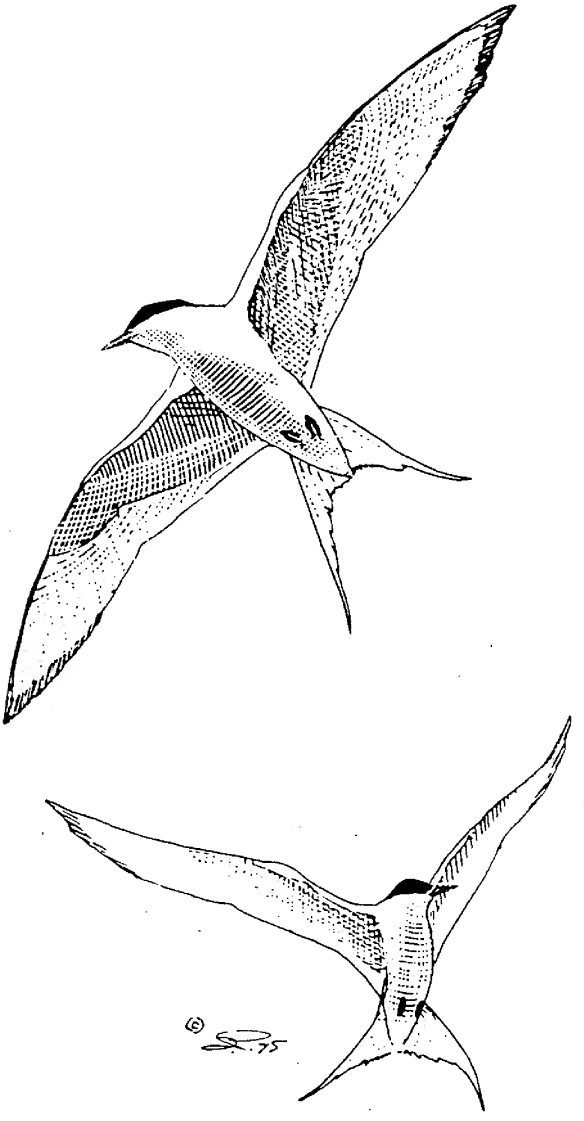
Several major oilspills since 1984 have emphasized the need for updated and comprehensive information on the numbers of birds breeding a seabird colonies. Periodic colony censuses have played an important role in management decisions relating to restrictions on gillnetting in California. Seabird colony censusing was a principal part of research programs in the 1970's and resulted in the identification of all the major seabird colonies on the west cost and that least a preliminary count or estimate of the number of individuals present. However, during the last ten years colony censusing has received less attention as the emphasis in seabird research has shifted from studies of distribution and abundance to breeding biology and trophics.

The recent Exxon Valdez and southern California oilspills underscored the necessity for up-to-date and accurate colony censusing, both for anticipating and assessing the impacts of major pollution events. Unfortunately for many areas colony censuses are historic in nature and/or of questionable accuracy. The last published colony information for Alaska is from 1977 based on a single estimate. Although the Catalogue of Washington Seabird Colonies (Speich and Wahl, 1989) was recently published, all information presented was gathered before 1983.

At the PSG meeting in Victoria the need for government agencies maintaining, regularly updating, and distributing information from seabird colony databases was discussed at the Executive Council meeting and a separate meeting on seabird colonies. A PSG Seabird Colony Committee was formed to examine ways in which the Pacific Seabird Group can notify both government agencies and conservation groups of the paucity of recent and accurate seabird colony censuses and urge the initiation of programs t keep colony databases current through a continuing censusing effort. Persons wishing to join this committee should contact harry Carter, USFWS, 6924 Tremont Rd., Dixon, CS 95620

Sowls,A.L., S.M. Hatch, and C.J. Lensink. 1978. Catalog of Alaskan Seabird Colonies. U.S. Dept. Interior, USFWS, Biol. Serv. Prog. FWS/OBS-78-78, 153 pp.

Speich, S.M., and T.R. Wahl. 1989. Catalog of Washington seabird colonies. U.S. Fish and Wildl. Serv. Biol. Rept. 88(6). 510 pp.



THE PROGRAM CHAIR'S COMMENTS
SIXTEENTH ANNUAL MEETING

Royal British Columbia Provincial Museum
Victoria, British Columbia, Canada
D. Siegel-Causey

The 1989 PSG Annual Meeting was held in the superlative facilities of the RBCPM. The meetings organized by the Local Committee chaired by Alan Burger and all activities were hosted by the Museum through the daily efforts of Elaine Gibb. I am sure all of the persons who attended appreciate very much the effort of everyone who helped make this a memorable gathering.

About half of the papers given at the Annual Meeting were associated with the symposium on North Pacific Seabirds organized by Kees Vermeer, Ken Briggs, Stewart Fefer and myself. The talks in the symposium were organized around three main themes: biological accounts of the species, distribution of birds at sea, and historical and conservation issues. Stan Senner organized a short workshop based on the examining the effects of oilspills on seabirds, and Lora Leschner chaired a comprehensive workshop devoted to Marbled Murrelets. The remaining papers in the general section covered a broad range of subjects including improved techniques for attaching radiotransmitters, the effects o several types of predators on seabirds, interactions f seabirds with the physical environment, discussions on new behavioral observations, and reports on new breeding colonies discovered in the USSR.

The quality and diversity of papers was among the highest I have experienced and although everyone was a bit groggy by the end, it was a great experience. I hope to see you in Monterey next year.

ABSTRACTS

THE BIOLOGICAL CONSEQUENCES OF ENSO: EL NINO, LA NINA, AND EL VIEJO

Ainley, D. G., W. J. Sydeman, S. D. Emslie, and P. Pyle (Point Reyes Bird Observatory, 4990 Shoreline Highway, Stinson Beach, CA 94970)

A 19-year record of breeding success and chick fledging weights for 7 seabird species (cormorants, gulls, and alcids) at Southeast Farallon Island, California, reveal a cycle of extraordinarily productive and unproductive years. The cycle coincides with that of the EL Nino - Southern Oscillation (ENSO). Among Farallon seabirds anomalously productive years compensate the poor "El Nino" years. The pattern is most evident in species having clutch sizes >1. The oceanographic mechanisms by which the pattern comes about will be discussed.

UNDERSTANDING SUBTLE AND ADVERSE EFFECTS OF BIOLOGICAL FIELD ACTIVITIES AND OTHER DISTURBANCES ON PACIFIC SEABIRDS

Anderson, D. W. (Dept. Wildlife and Fisheries Biology, Univ. California, Davis, CA 95616), J. Burger (Dept. Biological Sciences, Rutgers University, New Brunswick, NJ 08903), D. L. Jaques (Dept. Wildlife and Fisheries Biology, Univ. California, Davis, CA 95616)

Many field biologists (both researchers and mangers) are slow to recognize or admit that their own field activities may have an adverse impact on their seabird study subjects or the data they gather. Curiosity-seekers and others who cause more overt disturbances are either ignorant of their effects or simply do not care. In other instances, some species of seabirds seem tolerant to or adaptive toward many types of disturbances. The results vary in magnitude and from species to species, but they often result in detrimental effects to the study subjects or to nearby, associated flora and fauna. Minimizing the adverse effects of research or management activities often rely on the integrity of the person in the field, but more overt types of nonconsumptive uses need to be managed more directly. All disturbances are subject to logical management and control. There is a developing field of data suggesting that disturbance thresholds and habituation levels can be used to better control undesired effects of disturbances to grouped seabirds.

IMPACTS OF INTRODUCED PREDATORS ON NESTING SEABIRDS IN THE NORTHEAST PACIFIC

Bailey, F. P. (U.S. Fish and Wildlife Service, Homer, AK 99603, USA), G. W. Kaiser (Canadian Wildlife Service, Delta, BC, Canada, V4K 3Y3).

Mammalian predators were once absent from most of the islands in the northeastern Pacific Ocean except those close to the mainland or connected by ice in winter. Throughout the area, introduced mammals continue to modify the habitat and affect nesting productivity but those impacts do not compare to the callous exploitation of seabirds as fox food. Foxes devastated seabird colonies throughout the southwestern Alaska and left only a remnant population of Aleutian Canada Geese on three small sites. Introductions have been recorded since 1750 when arctic fox were placed on the westernmost Aleutians. Red and arctic foxes as well as rats, ground squirrels, and other rodents were released on Alaskan islands throughout the 1800's and early

1900's. Roughly 450 islands had been stocked by 1930 when the first government surveys raised concerns about disappearing seabirds voiced by the Aleuts as early as 1811. Raccoons, mink, and other fur-bearers have been introduced to islands in British Columbia in this century. Rats are causing current problems but raccoons released on the Queen Charlotte Islands may soon start to exploit seabird colonies. Further south, agricultural animals and lost pets have caused more problems than introduced fur-bearers. Most colonies are protected and wherever intensive efforts have been made to relieve problems, the populations of colonial seabirds have responded quickly.

STORM-PETREL ABUNDANCE, DISTRIBUTION, BREEDING BIOLOGY AND CONSERVATION

Boersma, P. D. (Institute for Environmental Studies and Dept. of Zoology, Univ. Washington, Seattle, WA 98195), M. J. Groom (Dept. of Zoology, Univ. Washington, Seattle, WA 98195)

Although estimation of population sizes and distributions are problematic in storm-petrels, it is probably that few species which nest in the north Pacific are in danger of extinction. Leach's and Fork-tailed storm-petrels are the most abundant and widely distributed species, with populations of over 15 million each. Madeiran and Tristram's storm-petrels are the next most abundant, with probable population sizes greater than 20,000 individuals. Black, Matsudaira's, Swinhoe's, and Ashy storm-petrels are the rarest having both restricted ranges and small population sizes (fewer than 20,000). All species have a similar breeding biology, with variation in the substrate used for burrows being the most critical difference for their conservation. Mammals, such as otters, are notably efficient and devastating predators in storm-petrel colonies, despite storm-petrels avoidance of nest visits during daylight and well-illuminated nights. Increasing populations of various gull species and raptors which consume storm-petrel adults may pose a progressive threat to storm-petrel populations. Predation (particularly on adults), pollution, and to a lesser extent, habitat modification, may be of concern in the conservation of the rarest species of storm-petrels. With increased environmental degradation, we expect that ingestion of petroleum and toxic chemicals, and especially of plastics may pose greater problems for some populations.

STATUS, ECOLOGY AND CONSERVATION OF TERNS OF THE TEMPERATE NORTH PACIFIC

Buckley, P. A. Buckley (NPS Coastal Research Ctr., Graduate School of Oceanography, Univ. Rhode Island, RI 02882), R. B. Clapp (Natl. Fish & Wildlife Laboratory, Natl. Museum of Natural History, Washington, DC 20560), and F. G. Buckley (Ctr. for Coastal & Environmental Studies, Rutgers Univ., New Brunswick, NJ 08903).

Twenty-one species of terns breed in the Temperate North Pacific (i.e. between 22.5 and 66.5 N latitude). They fall into three major groups, those with origins and distribution mainly (1) offshore/tropical (4 species, plus 4 shared with coastal Asia); (2) Asiatic (4 species plus 4 shared with the Pacific Ocean); and (3) North American (4 species plus 4 shared with the Pacific Ocean). Chinese Crested, Elegant (both "crested" terns), and Aleutian are the only breeding endemic terns. Most or all of the tropical terns reach their worldwide northern limits of distribution in the TNP, although limiting factors are not clear. In some species (Blue-grey Noddy) it may be food, in

others (Black Noddy) it may be habitat. In still others, seasonal-temperature, wind, or food variation, or exotic quadrupeds may also play pivotal roles. Competitive exclusion seem to be undemonstrated. Few comparative ecological data on diets and feeding ranges of these animals in the TNP exist, but some suggest that oceanic (thus, essentially tropical) species are food generalists, while continental (thus, temperate) species are food specialists, factors that may also relate in undemonstrated ways to their colonizing histories and abilities. Scant data are at hand confirming population hazards to breeding species from oil pollution, plastics or gill-netting. However, disturbance and exotic quadrupeds may be more important threats on some (but paradoxically not other) oceanic island, while development/habitat loss, disturbance, and local pollution may be more important on continents. Two endemic taxa, Chinese Crested and Elegant terns, merit attention: no breeding locations (let alone population estimates) are known for the former, while the latter is all but restricted to a handful of Sea of Cortez islands. Both should be designated Endangered. Aside from the North American coast and Hawaiian islands, recent data on breeding population sizes for almost all TNP terns are spotty or missing, as they are for their island distributions and there are virtually no published data on at-sea/winter tern populations or their biological importance. Indeed, the entire winter range of one of the three endemics, Aleutian Tern, is also unknown. Ecological and conservation priorities become obvious in the light of this dearth of data.

STATUS AND ECOLOGY OF OFFSHORE FISH-FEEDING ALCIDS (MURRES AND PUFFINS) IN THE NORTH PACIFIC OCEAN

Byrd, G. V. (U.S. Fish and Wildlife Service, Box 5251, Adak, AK 98791), E. C. Murphy (Inst. Arctic Biology, Univ. Alaska, Fairbanks, AK 99775), G. W. Kaiser (Canadian Wildlife Service, Box 340, Delta, British Columbia, V4K 3Y3), A. Kondratiev (Inst. Biological Sciences of the North, Karl Marx Str 24, 685010 Magadan, USSR)

Five species of alcids in the genera *Uria*, *Cerorhinca*, and *Fratercula* comprise a guild of diving, offshore fish-eaters which nest in colonies on offshore islets and coastal headlands between 34 - 70 N on the Asian and North American sides of the Pacific offshore fish-feeding alcids are susceptible to decimation by exotic predators, gill nets, oil spills, and reduction of food stocks by commercial fishing and natural environmental perturbations. Standard monitoring methods have been implemented for tracking trends in murre breeding populations in Alaska within the past decade, and declines are suggested at several sites in the Bering Sea. Furthermore, gill nets have caused the decline of murres in northern California. Puffins have not been closely monitored except in a few isolated instances, so trends are generally unknown. Food habits studies of fish-feeding seabirds are increasing our understanding of processes which cause fluctuations in reproductive performance and population levels, and they are providing valuable information on the distribution and relative seasonal abundance of young fish.

SEABIRD BREEDING POPULATION TRENDS IN NORTHERN AND CENTRAL CALIFORNIA: 1979 TO 1989

Carter, H. R., D. L. Jaques, C. S. Strong, G. J. McChesney, M. W. Parker (USFWS, Northern Prairie Wildlife Research Center, 6924 Tremont Road, Dixon, CA 95620)

In 1989, we surveyed 302 (including 54 newly-discovered) nesting areas of 14 nesting seabird species between the Oregon border and Point Conception, California, under an inter-agency agreement with Mineral Management Service. Major trends in population size were identified by direct comparison of 1989 estimates with those derived from 1979-1980 USFWS surveys and other historical estimates listed in the Catalog of California seabird colonies (Sowls et al. 1980). Marked declines were found for Leach's Storm-petrels and Common Murres while marked increases were found for Double-crested Cormorants, Western Gulls, and Rhinoceros Auklets. Population estimates for seven other species require further analyses and/or field work before reliable trends can be established. Reasons for declines include mortality from gill-net fishing, oil spills, the 1982-1983 El Nino-Southern Oscillation event, and alteration of nesting habitat. Reasons for increases include species' range-wide phenomena and local changes in prey resources and nesting habitat use.

BREEDING PHENOLOGY OF BLUE-FOOTED BOOBIES IN THE GALAPAGOS ARCHIPELAGO, ECUADOR, 1981-1989

Coulter, M. C. (Savannah River Ecology Laboratory, Drawer E, Aiken, SC 29802)

Blue-footed Boobies in the Galapagos breed throughout the year. The factors that determine phenology are poorly understood. A quick method of determining timing of breeding was developed so that the phenology of a colony could be determined during a short visit to a colony. A complex of ocean currents run through the archipelago and the available food varies significantly both temporally and among areas. In the Western Archipelago, where the waters are most productive, colonies are large. These colonies include birds breeding at all stages of reproduction, but within the colonies, subcolonies are synchronous. Among the central islands, colonies are smaller, and phenology is similar among adjacent colonies but different between more distant colonies. On North Seymour Island, an important colony in the central islands, there was little synchrony during the early 1980's. However, during the last two years, colony size has increased substantially and the colony has become very synchronous. While there has definitely been immigration, reasons for the increase in synchrony are obscure.

EGG RECOGNITION IN THICK-BILLED MURRES

de Forest, L. N. (Univ. Ottawa, Ottawa K1N 6N5, Canada), A. J. Gaston (Canadian Wildlife Service, Ottawa K1A 0H3, Canada)

Tschanz (1959) found that the Common Murre can identify and retrieve its own egg displaced 50 cm from the nest site and reject a foreign egg placed at its site. We repeated Tschanz's experiment for a sample of Thick-billed Murres on Coats Islands, N. W. T. in 1989. The egg was displaced 20 cm from the nest site, and a foreign egg placed on the site. The majority of birds preferred to sit on the foreign egg rather than retrieve their own. In a

second experiment, the eggs of two nearby birds were placed together 20 cm away from their own sites and switched so that the closest egg to a bird was not its own. Eighty percent of the birds retrieved their own egg. It appears that unlike Common Murres, Thick-billed Murres can recognize and retrieve their own egg if displaced, but will first accept any egg on their site. Differences in behaviour and habitat between the two species as well as the implications for accepting vs. rejecting an egg on its site will be discussed.

A REVIEW OF SEABIRD MORTALITY IN GILLNET FISHERIES IN THE NORTH PACIFIC

DeGange, A. R., L. L. Jones, R. H. Day, J. E. Takekawa, and V. M. Mendenhall (Alaska Fish and Wildlife Research Center, 1011 E. Tudor Road, Anchorage, AK 99503)

Mortality of seabirds in coastal and high-seas gillnet fisheries in the North Pacific is reviewed. Losses of seabirds in gill nets set in coastal waters have been documented in Baja California, California, Oregon, Washington, British Columbia, Alaska, and Japan but generally, data from which to assess impacts are few. Coastal gillnet fisheries in central California substantially depressed a population of Common Murres in the early mid 1980s; legislative action has largely resolved that problem. Several large high-seas fisheries that operate in the North Pacific are known to affect or suspected to affect seabirds, including the Japanese land-based salmon fishery, the Japanese mothership salmon fishery, the Japanese, Korean, and Taiwanese squid fisheries, and the Japanese and Taiwanese large mesh fishery for albacore and billfish. Approximately 56,000 seabirds are killed annually in the land-based salmon fishery. Few data are available to assess mortality from the large mesh or squid fisheries, although mortality of seabirds in the squid fishery is potentially high. The Japanese mothership salmon fishery, formerly responsible for up to 250,000 seabird deaths annually in the early 1980s, was excluded from fishing in the U.S. Exclusive Economic Zone in 1988 and was substantially reduced in size and effort.

ANNUAL VARIATION IN BLACK GUILLEMOT EGG PARAMETERS OVER AN ELEVEN YEAR PERIOD

Divoky, G. J. (Inst. Arctic Biology, Univ. Alaska, Fairbanks, AK 99775)

Egg parameters were measured at a Black Guillemot colony during five years of colony expansion (27 to 175 pairs) and six years of a stable population, size with increasing average breeding experience. Egg volume increased with annual increases in the average breeding experience for the colony but decreased during a breeding season. No annual variation in egg shape was discovered although in other species eggs became shorter and broader with age of the female. Annual average clutch size ranged from 1.7 - 1.9 and was not related to the percentage of birds breeding for the first time or the average breeding experience of the colony. Annual variability in average date of clutch initiation was apparently related to environmental factors and showed no relation to average breeding experience.

THE IMPORTANCE OF MATE FIDELITY AND EXPERIENCE ON BREEDING SUCCESS IN CASSIN'S AUKLET

Emslie, S. D., W. J. Sydeman, P. Pyle (Point Reyes Bird Observatory, 4990 Shoreline Highway, Stinson Beach, CA 94970)

We monitored breeding success of individual Cassin's Auklets on Southeast Farallon Island, California, 1982-1989. Data on mate fidelity and experience were analyzed from 1985-1989 to reduce sampling biases from earlier years. During this period, over 40% of the total breeding attempts (n=178) were by newly mated pairs. Analyzed by year, a lower proportion of newly mated pairs occurred in 1986 (29.4%) and 1989 (35.5%) compared to 1987 (53.1%), the year with the highest proportion. These results correlate with annual variation in ocean productivity in the Gulf of the Farallones. The number of years of breeding experience and mate fidelity by banded adults were compared to hatching and fledging success and chick production using ANOVA and logistic regression ($p<.05$). Hatching success and chick production significantly increased during the first 3 years that a pair remained faithful, and with breeding experience; fledging success did not correlate with these variables. After 3 years, chick production but not hatching success may continue to increase with experience. Further data on older Cassin's Auklets are needed to determine this relationship.

STATUS, ECOLOGY AND CONSERVATION OF SHEARWATERS OF THE TEMPERATE NORTH PACIFIC

Everett, W. T. (Dept. of Birds and Mammals, San Diego Natural History Museum, P. O. Box 1390, San Diego, CA 92112), R. L. Pitman (Southwest Fisheries Center, P. O. Box 271, La Jolla, CA 92038).

Of the shearwaters which breed in the North Pacific, the species presently in the most peril is Townsend's Shearwater. Feral cats are a threat on its breeding grounds at Isla Socorro, and pigs have been released on Isla Clarion. More information is needed the current status of this species and for the Black-vented Shearwater, which also has well-established feral cats, populations at most of its nesting colonies. Efforts are being made to protect Newell's Shearwater in the Hawaiian Islands. The single greatest threat to migrant shearwaters is drift gillnet fisheries, which kill hundreds of thousands of birds annually. This ongoing destruction is probably far more substantial than the potential mortality from oil spills.

THE STATUS AND ECOLOGY OF INSHORE FISH-FEEDING ALCIDS (*Cepphus* GUILLEMOTS AND *Brachyramphus* MURRELETS) IN THE NORTH PACIFIC

Ewins, P. J. (Nature Conservancy Council, 7 Eastcheap, Letchworth, Hertfordshire, SG6 3DG, U.K.), H. R. Carter (U.S. Fish & Wildlife Service, 6924 Tremont Road, Dixon, CA 95620, USA), Y. Shibaev (Inst. Biology and Soil Sciences, USSR Academy of Sciences, Vladivostok 690022, USSR)

Five species of inshore fish-feeding alcids occur in the North Pacific. The Black Guillemot frequents the northern Bering Strait in small numbers but is more numerous in arctic regions. The breeding range of Kittlitz's Murrelet extends into the Chukohi Sea but the remaining three species (Pigeon Guillemot, Spectacled Guillemot, and Marbled Murrelet are found only in the North Pacific. These species are relatively sedentary. Guillemots usually

breed in cliff crevices or amongst boulders but regularly occupy man-made cavities. Murrelets nest on rocky ground, often well inland, or on branches in mature forests (Marbled only). Censusing is difficult for these five species because they tend to breed in dispersed, relatively small colonies, or as isolated pairs, spread over large areas. Consequently, status changes are difficult to assess accurately. However, reliable survey techniques have recently been developed. There are strong indications that populations have declined in some areas due to factors such as: introduction of ground predators (guillemots), destruction of old growth forests (Marbled Murrelet) and oil pollution. Data from the few studies of breeding biology and feeding ecology are summarized and recommendations made for future survey and research priorities.

RADIO-TAG AND EPOXY GLUE TESTS APPLICABLE TO SEABIRD RESEARCH

Fleming, T. L., D. H. Varoujean, S. M. Speich, B. C. Scheuch (7701 Zangle Rd NE, Olympia, WA 98506)

A review of Marbled Murrelet and other seabird research showed a highly variable rate of success for radio-tag projects. Tagged birds regularly disappeared, often attributed to death or tag failure. Tags seldom appeared to be chosen or custom-designed for optimal size, shape, and weight to accommodate seabird aerodynamics or hydrodynamics and behavioral considerations. Attaching tags to birds with epoxy seems to have been, by far, the most successful method used, but also appeared to have excessive failures or limitations. "Worst-case" testing by hyperbarics, continuous submersion in seawater, etc., of eight Holohil microminature radio-tags yielded no premature tag failures and led to the conclusion that epoxy attached tags become detached and lost at sea. In most cases, an inappropriate epoxy was used. Optimal epoxy and attachment methods are discussed in context with appropriate radio-tag selection and testing.

INTER-COLONY COMPARISONS OF FIELD METABOLIC RATE AND REPRODUCTIVE ENERGETICS IN THICK-BILLED MURRES

Flint, E. N., G. L. Hunt, Jr. (Dept. Ecology and Evolutionary Biology, Univ. of California, Irvine, CA 92717)

We compared measures of reproductive effort of Thick-billed Murres nesting on St. Paul and St. George islands, colonies of different size (2.3 x 10^5 and 2.7 x 10^6 murres respectively), Pribilof Islands, Bering Sea. In contrast to findings from the 1970's, in 1987 and 1988 we found no significant difference in growth rate of chicks on the two islands. Field metabolic rates (FMR) of adults measured using doubly-labeled water during the chick rearing period were not significantly different between islands. As observed in other alcids, the FMR's were high, 1.5 the rate predicted for seabirds and 1.9 times the rate for all nonpasserine birds. The ratio of FMR to basal metabolic rate in these birds was 2.75. Chick food intake as estimated from water turnover measured using isotopes did not differ between colonies or years and averaged 58.3 g day. Foraging trip lengths did not differ significantly between islands. Adult body mass, culmen, and tarsus did vary significantly with birds on St. Paul averaging 10% larger than birds on St. George. Despite differing colony sizes and hydrographic environments Thick-billed Murres in the Pribilofs exhibited similar energetic responses in all measures of reproductive effort that we measured.

POPULATION PARAMETERS FOR THE ANCIENT MURRELET

Gaston, A. J. (Canadian Wildlife Service, 100 Gamelin Blvd, Hull, Quebec, Canada K1A 0H3)

The Canadian Wildlife Service has captured adult Ancient Murrelets over six years and departing chicks for five years at Reef Island, in the Queen Charlotte Islands, B.C. A few chicks return to the colony in their first year, but the majority of prospectors are second and third year birds. Reproduction begins at 2-4 years old, and pairs rear about 1.5 chicks/year. Prebreeders visit several colonies before settling to breed and philopatry is probably relatively low. Capture of breeding adults reduces the chances of recapturing them the next year, giving an artificially low estimate of survival if all recaptures are considered. Using only recaptures in the second and subsequent years after banding, annual survival of breeders is estimated to be 78%, unusually low for an alcid.

SEX-SPECIFIC FORAGING DIFFERENCES IN BROWN BOOBIES IN THE EASTERN TROPICAL PACIFIC

Gilardi, J. D. (Graduate Group in Ecology, Department of Avian Sciences, University of California, Davis, CA 95616)

The distribution of foraging Brown Boobies was noted in the vicinity of Clipperton Island (Fr.) during a NOAA cruise on the R/V D.S. Jordan. A significant difference in the distribution of the sexes was observed: females predominated beyond 40 nm and males predominated within 20 nm of the colony. There was also a strong indication that males return to the colony earlier in the evening. The possibility that this foraging difference is related to differential parental investment and reversed-size sexual dimorphism is discussed.

DISTRIBUTION PATTERNS OF SEABIRDS IN THE CENTRAL NORTH PACIFIC

Gould, P. J., and J. F. Piatt (Alaska Fish and Wildlife Research Ctr., U.S. Fish and Wildlife. Serv., 1011 E. Tudor Road, Anchorage, AK 99503)

The Central North Pacific Ocean hosts a mixed assemblage of seabirds. Species breeding in eastern and western extremes of the Pacific and from the Antarctic to the Arctic occur there with regularity. The region is structured oceanographically by a broad Transition Zone between Subtropical and Subarctic waters that is bordered by a subarctic front at 40-45 N latitude and a subtropical front at 30-32 N latitude. The avifauna is comprised of species that generally occupy Subarctic (e.g., kittiwakes, puffins) or Subtropical waters (e.g., tropicbirds, *Sula* spp.) but may penetrate into Transitional waters, species that concentrate in the Transition Zone (e.g., Red Phalaropes, Solander's Petrels), and species that occupy all water types about equally (e.g., Black-footed Albatross). These zoogeographic patterns parallel those observed for some plankton, squid and fish species in the region. On surveys conducted in October and November of 1989, we observed large sea surface salinity and temperature gradients at both subarctic and subtropical fronts. Birds and their potential prey (as determined by hydroacoustics) did not appear to aggregate at the fronts, but rather the fronts served as boundaries in some seabird distributions. Seabird densities were markedly higher in Subarctic waters than in Transitional and Subtropical waters.

INFLUENCE OF PYCNOCLINE TOPOGRAPHY ON MARINE DISTRIBUTIONS OF PLANKTIVOROUS AUKLETS *(Aethia, Cyclorrhynchus)* IN ANADYR STRAIT, NORTHERN BERING SEA, ALASKA

Haney, J. C. (Woods Hole Oceanographic Institution, Woods Hole, MA 02543 USA)

Least, Crested, and Parakeet auklets each exhibited distinct preferences for different water column characteristics in Anadyr Strait near St. Lawrence Island. Least Auklets were more abundant in mixed water, but they also occurred within stratified water where the pycnocline and upper-mixed layer were shallow (< 8 m) and thin (< 10 m). Low body mass (85 g), high buoyancy, and relatively poor diving ability may have restricted Least Auklets to areas where water column strata nearly intersected the surface, or to areas where strata were absent altogether due to strong vertical mixing. Crested and Parakeet auklets, larger-bodied (ca. 260 g) species with presumably greater diving ability, were more abundant in stratified water, and both generally exhibited less specific affinities for water column characteristics at intermediate and shallow levels. Crested Auklets foraged over relatively deep (12-17 m) and non-compressed (6-23 m) pycnoclines. Parakeet Auklets showed little discrimination for any shallow water column characteristic. Measured by the strength of the pycnocline, all three auklets avoided areas with strong (> 0.22 units m^{-1}) subsurface flow fields in the water column. Auklet distributions tended to correspond with: 1) strata accessibility as estimated from relative diving ability, 2) avoidance of current shear at depth, and 3) habits and distributions of plankton prey.

WATER COLUMN STRUCTURE, BATHYMETRY, AND COARSE-SCALE DISTRIBUTIONS OF LARGE ALCIDS *(Uria, Cepphus, Fratercula)* NEAR ST. LAWRENCE ISLAND, ALASKA

Haney, J. C. (Woods Hole Oceanographic Institution, Woods Hole, MA 02543 USA)

Ship-board CTD surveys resolved coarse-scale (5-10 km) horizontal and fine-scale (1-10 m) vertical variation in water column structure and bathymetry for the coastal zone around western St. Lawrence Island in the northern Bering Sea, Alaska, during August and September 1987. Distributions of murres, Pigeon Guillemots, Tufted and Horned puffins showed no consistent relationships to water column strata at shallow and intermediate depths (i.e., the pycnocline, upper- and lower-mixed layers). Each species was more common in stratified than in vertically-mixed waters, but differences in abundance between mixing regimes were small or non-significant. The only variable to which all species responded was total water column depth: each alcid preferentially used areas with shallow sea floors and avoided areas with deeper sea floors. In contrast to small-bodied alcids feeding on plankton, large alcids did not generally discriminate among foraging areas as a function of pycnocline topography and strength. This can be attributed to: 1) greater reliance on large active, non-pycnocline-associated pelagic and benthic prey, 2) higher body mass, lower buoyancy, and greater diving ability, or 3) foraging over a shallow continental shelf where all vertical strata, including the sea floor, were potentially accessible from the ocean surface.

A SUMMARY OF THE LAWS AND TREATIES OF CANADA, CHINA, JAPAN, KOREA, USA, AND USSR THAT PROTECT SEABIRDS AT LAND AND SEA

Harrison, C. S. (Hunton & Williams, Washington, D.C.), Kyong-su Choe (Korea University, Seoul), He Fen-qi (Institute of Zoology, Academia Sinica, Beijing), N. Litvinenko, Y. Shibaev (Institute of Biology and Soil Science, USSR Academy of Sciences, Vladivostok)

The nations of the North Pacific have entered into several international agreements and have enacted national legislation that protect seabirds on their breeding colonies and fishing grounds. The intentional dumping of plastics, oil, and other refuse in the ocean has been banned. Each nation has established some parks or refuges which are used by breeding seabirds. Enforcement of existing laws and regulations remains a problem. The longline driftnet fishery for squid in the international waters of the North Pacific remains a contentious issue. Taiwan, Korea, and Japan have agreed to monitor the effects of this fishery on marine wildlife such as seabirds. The United Nations General Assembly is expected to adopt a resolution introduced by New Zealand by which concurring governments would agree to a worldwide moratorium on longline driftnet fishing.

RACCOON-SEABIRD INTERACTIONS ON THE QUEEN CHARLOTTE ISLANDS: ASSESSING THE RISK

Hartman, L. H. (Biology Dept., Univ. Victoria, Box 1700, Victoria B.C. V8W 2Y2, Canada)

The introduction and subsequent spread of raccoons (*Procyon lotor*) on the Queen Charlotte Islands has raised concern over their potential impact on native, burrow-nesting seabirds. A comparative study examining raccoon foraging ecology and habitat use patterns in the presence and absence of raccoons in an area devoid of seabirds. Two male and two female raccoons were radio-collard, and fifty to sixty locations per animal obtained in summer and winter field sessions. Home ranges were <1 km sq., and were smaller and better defined for the females. Study animals foraged primarily at night and in the intertidal zone, and scats collected showed crab to be the predominant food item. Movement onto and off of adjacent colony islands was documented for one male, but occurred outside the seabird nesting season. The detailed foraging and habitat use information gathered in the remainder of Phase One will be used a) as a basis for comparison with observations made in the presence of seabirds, b) to evaluate the potential of colony islands to support resident raccoon populations.

STATUS AND ECOLOGY OF NORTHERN FULMARS IN THE NORTH PACIFIC

Hatch, S. A. (Alaska Fish and Wildlife Research Center, U.S. Fish and Wildlife Service, 1011 E. Tudor Road, Anchorage, AK 99503)

The breeding distribution of Northern Fulmars in the Pacific consists of a small number of very large colonies (50,000 - 500,000 individuals) and a few minor ones (5 - 5,000 individuals). The almost complete separation of light and dark color phases between adjacent colonies in the Bering Sea and Sea of Okhotsk suggests there is little gene flow among the major population centers. Annual productivity averaged 0.41 chicks per breeding pair in 9 years at one colony in the Gulf of Alaska; adult survival was 0.97 yr^{-1} over

5 years in the same location. A simple life table analysis suggests the Pacific population is capable of growth under present conditions, although nothing comparable to the rapid expansion of fulmars in the North Atlantic is evident. There is no clear indication of populations change at either of two major colonies, but one small colony in the western Aleutians has increased greatly since the mid-1970's. The history and status of other small colonies are unknown. Fulmars appear to have low vulnerability to oil pollution and gill nets, but they are relatively heavy consumers of plastic debris. Introduced predators may have caused considerable damage to fulmar populations in the past. It is recommended that population monitoring be continued at one or two of the major Pacific colonies and several of the smaller ones. The latter may provide the best indication of overall population trend.

STATUS AND ECOLOGY OF KITTIWAKES IN THE NORTH PACIFIC

Hatch, S. A. (Alaska Fish and Wildlife Res. Ctr., U. S. Fish and Wildlife Service, 1011 E. Tudor Road, Anchorage, AK 99503), G. V. Byrd, Jr. (Alaska Maritime Natl. Wildife Refuge, Aleutian Islands Unit, Box 5251 NAS, Adak, AK, FFO Seattle, WA 98791-0009), D. B. Irons (U. S. Fish and Wildlife Service, 1011 E. Tudor Road, Anchorage, AK 99503), G. L. Hunt, Jr. (Dept. Ecology and Evolutionary Biology, Univ. California, Irvine, CA 92717).

Black-legged Kittiwakes are widely distributed in the subarctic North Pacific Ocean and adjacent seas, with a total breeding population of some 2.5 million individuals. Red-legged Kittiwakes are confined to breeding in 4 locations, and at least 95% of their estimated world population of 230,000 individuals occur on one island (St. George, Pribilof Islands). Compared to Black-legged Kittiwakes in the North Atlantic Ocean, both species have worsened during the 1980's, with recent (1986-1989) estimates of annual productivity averaging 0.17 young/pair. The frequency of "colony-failures" (<0.1 young/pair) has exceeded 50% in Alaska since 1980. Poor productivity has involved to varying degrees the failure of many birds to lay eggs, reduced clutch sizes, low hatching success, and poor chick survival. There is evidence of population declines in some colonies, but others appear to be stable or increasing. High adult survivorship (recent estimates averaging 95% in one colony) may account for the relative stability, but widespread declines are anticipated unless productivity improves. The evidence suggests a natural decline in the abundance or surface availability of key prey species, but the possible role of commercial fisheries, pollution, disease, or other factors cannot be excluded at present.

A REVIEW AND SYNTHESIS OF MIXED-SPECIES FLOCK DYNAMICS IN SEABIRDS

Heinemann, D. (Manomet Bird Observatory, Manomet, MA 02345)

Mixed-species seabird flocks are a common component of many near-shore or continental-shelf ecosystems in temperate and polar latitudes, and of tropical pelagic communities. These aggregations form where physical or biotic factors concentrate prey (e.g. tidal currents or predatory marine mammals), and can exist over a wide range of spatial and temporal scales. Many authors have recognized that different species play different "roles" in the formation, maintenance and, occasionally, suppression of mixed-species flocks. I have found that no one role-classification scheme can be applied to all situations, suggesting that different sets of processes are responsible

for flocking dynamics in different situations. I use existing studies to suggest classifications of mixed-species flock types, the "roles" played by the different species, and the processes affecting the dynamic behavior of the flocks.

MARINE BIRD USE OF NEARSHORE HABITATS IN THE KRENITZIN ISLANDS, ALEUTIAN ISLANDS, DURING THE NON-BREEDING PERIOD

Herter, D. R. (LGL Alaska Research Associates, Inc.,505 W. Northern Lights Blvd., Suite 201,Anchorage AK 99553)

Very little data exists on the distribution, abundance, or habitat use of marine birds occurring in the eastern Aleutian Islands, Alaska during the non-breeding period. The coastline of the Krenitzin Islands from Unimak Pass to, and including, Unalga Island were surveyed by small boat during each of three periods roughly corresponding to fall (21 Sept. - 1 Oct. 1986), winter (21 Feb. - 6 Mar. 1987), and spring (29 April - 8 May 1987) seasons. All marine birds observed in a 200-m band including the shoreline and nearshore waters were enumerated and behavior and habitat use patterns noted. Loons and grebes occurred in small numbers throughout the study period. Proportions of Pelagic Cormorants in relation to identified individuals of other cormorant species increased dramatically in winter, probably indicating immigration of birds from more northerly ice-bound breeding sites. Red-faced Cormorants decreased at this season and may have moved to offshore feeding areas. Emperor Geese and seaducks showed highest densities in winter but overall abundance in this island group was much lower than on the adjacent distal portions of the Alaska Peninsula. Emperor geese exhibited a preference for wave-washed rock terraces as winter habitat and seaducks preferred the relatively shallow waters of small bays in winter. Glaucous-winged Gulls decreased in abundance in winter, possibly indicating movement offshore, while Mew Gulls reached their peak abundance in nearshore waters at this season. Whiskered Auklets, while never straying far from tidally mixed waters near the islands, were found in highest abundance close to shore in small tide rips and generally in smaller groups in winter than at other seasons.

DRIFT-BLOCK EXPERIMENTS TO HELP THE ANALYSIS OF RECOVERY RATES OF OILED SEABIRDS

Hlady, D. A. (Ministry of Environment, Planning, and Assessment Branch, 777 Broughton St., Victoria, B.C. V8V 1X5, Canada), A. E. Burger (Dept. Biology, Univ. Victoria, Victoria V8W 2Y2, Canada)

A major problem in assessing the mortality of seabirds following oil spills is to estimate the proportion of carcasses which are found on beaches. On 23 June 1989, we released 300 bird-sized drift-blocks off the west coast of Vancouver Island, to simulate an inshore oil spill, and searched beaches to recover the blocks. Overall, 42% of the blocks were recovered, and 94% were found within 16 days. Most blocks were found within 10 km of the release site, but some travelled over 100 km. Recovery rates varied with different beach substrates. Blocks released on incoming tides were found more frequently than those released on outgoing tides (47% and 35%, respectively). Recovery rates were 50%, 44%, and 33% for blocks cut to the sizes of Common Murres, Pigeon Guillemots, and Cassin's Auklets, respectively. Additional experiments are in progress under winter conditions.

USE OF STABLE ISOTOPE ANALYSIS IN SEABIRD DIETARY STUDIES

Hobson, K. A. (Dept. Biology, University of Saskatchewan, Saskatoon, Sask. S7N OWO, Canada)

Recently it has been shown that stable carbon and nitrogen isotope ratios in animal tissues can provide an estimate of trophic status. I have investigated the application of this technique to seabird dietary studies by measuring isotopically the tissues of seabirds and their prey from locations in British Columbia and the high Arctic. As expected from lower trophic level feeders, Dovekies showed the least isotopic enrichment of ^{15}N and ^{13}C. Glaucous Gulls showed the highest enrichment of both isotopes. The theory of the stable isotope technique is explained and its application to both contemporary and palaeodietary studies is discussed.

THE ECOLOGY, STATUS, AND CONSERVATION OF GADFLY PETRELS IN THE TEMPERATE NORTH PACIFIC

Hu, D. and J. A. Bartle (Dept. Wildlife and Fisheries Biology, Univ. California, Davis, CA 95616)

Of the eleven species of gadfly petrels that occur abundantly in the temperate North Pacific, *Pterodroma phaeopygia sandwichensis*, *P. hypoleuca*, and *Bulweria bulwerii* breed there. Limited breeding information exists for these; the single colony of *P. p. sandwichensis* is best understood. Although *B. bulwerii* also breeds outside the region, temperate Pacific colonies appear important. Japanese colonies of *P. hypoleuca*, a North Pacific breeder, remain unstudied. However, non-breeding distribution is documented for these populations, but is speculative for *P. p. sandwichensis*, *B. bulwerii*, and Hawaiian populations of *P. hypoleuca*. Alien organisms threaten some colonies, although most breeding populations in Hawaii appear stable. Other *Pterodroma* species are trans-equatorial boreal migrants, six from the southwest and two from the southeast Pacific. All but *P. cervicalis*, *P. inexpectata*, *P. nigripennis* and *P. arminjoniana heraldica* face threats on some or all of their breeding grounds. Smaller species (subgenus *Cookilaria*) are more abundant, particularly *P. nigripennis* and *P. inexpectata*. They are present in large numbers, although population sizes are not as high as those of the southern shearwaters (*Puffinus*) making similar migrations.

AUKLET DISTRIBUTION IN RELATION TO THAT OF ZOOPLANKTON PREY IN THE BERING SEA

Hunt, G. L., Jr. (Dept. Ecology and Evolutionary Biology, University of California, Irvine, CA 92717), N. M. Harrison (Nature Conservancy Council, 17 Rubislaw Terrace, Aberdeen Ab1 1XE, Scotland), J. Piatt (USFWS, 1011 E. Tudor Road, Anchorage, AK 99503)

Small auklets in the Bering Sea forage on a wide variety of zooplankton. Little is known of the foraging ecology of the Whiskered Auklet and somewhat more is known about the pelagic biology of the Crested Auklet, which specializes in taking euphausiids, and the Parakeet Auklet, which takes a broad range of prey, including gelatinous prey. The foraging ecology of the Least Auklet, a specialist on large copepods, is best known. In the northern Bering Sea, these birds concentrate their foraging over strongly stratified water and near fronts where pycnoclines may approach the surface. In the

Aleutian Islands, Least Auklets forage where oceanic and tidal currents, striking the shelf between the islands, rise toward the surface carrying plankton with them. Least Auklets prefer to forage in, and may require, situations where hydrographic structure causes the concentration of zooplankton or moves zooplankton high in the upper water column.

PLUMAGE VARIABILITY FUNCTIONS FOR STATUS SIGNALLING IN LEAST AUKLETS

Jones, I. L. (Dept. of Biology, Queen's University, Kingston, Ontario K7L 3N6 Canada)

I investigated whether the variable plumage of the Least Auklet, a small seabird of the Bering Sea, functions for status signalling. Fieldwork was conducted at St. Paul Island, Pribilof Is., Alaska. Adult least auklets varied continuously in underpart colour from unmarked white to nearly black. Plumage varied within age groups, but adults tended to lighten in plumage as they aged. There were no differences in plumage between the sexes. Observations of natural interactions among adult and immature birds of different plumage indicated that lighter birds usually defeated darker birds in agonistic interactions within each age group. Model presentation experiments were performed to test whether plumage colour alone signals social status. Auklet models presented in white plumage were approached less closely and induced more responding adult and immature birds to flee compared to the same models presented with dark plumage. Furthermore, lighter plumaged birds approached the white model closer than did darker plumaged birds. The results provide the first evidence for status signalling by plumage in a non-passerine bird and document another species where status signalling works within age categories.

DISTRIBUTIONAL RESPONSES OF CANVASBACKS TO WEATHER AND HABITAT CHANGE

Lovvorn, J. R. (Dept. of Zoology and Physiology, University of Wyoming, Laramie, WY 82071)

Loss of the plant-tuber foods of Canvasbacks wintering in upper Chesapeake Bay has resulted in their eating mostly clams. To examine the consequences of this habitat change, I investigated how seasonal availability of tubers and clams affects their use by Canvasbacks in the U.S. mid-Atlantic region, and how regional Canvasback distributions are influenced by food availability and weather. Estimates of ice cover on Chesapeake Bay from 1956-1987 suggest that tubers were often inaccessible for parts of January and February, regardless of their abundance. In North Carolina where ice is seldom an important factor, sequential use of tubers and then clams appears to result from initially high foraging efficiency for tubers which declines as tubers are depleted. Above evidence suggests that historically clams were a principal food Or Canvasbacks throughout this region during many winters. Despite dramatic distributional responses to weather later in winter, Canvasback numbers in Maryland in early January have declined since the early 1970's independently of weather trends, apparently because of the loss of tuber-producing plants there. Decreased Canvasback numbers in Maryland in early January have corresponded to increases in Virginia and North Carolina, but this shift is not related to greater availability of plant foods in the latter two areas. The southward shift of Canvasbacks suggests that with loss of tubers from Maryland, the food base there of clams alone is sometimes inadequate. Because clam populations fluctuate widely among years and

different areas, effects of the loss of plant tubers on Canvasback populations probably depend on the frequency and geographic extent of shortages of alternative clam foods.

YELLOW-BILLED LOONS AND THE ALASKA OIL SPILL

McIntyre, J. W. (Utica College of Syracuse University, Utica, NY 12502)

Aerial surveys were conducted over three locations on the breeding grounds where previous Yellow-billed Loon studies had been conducted, and a fourth site was surveyed from the ground. No decline in number of summering adults could be discerned, although this species was considered to have suffered a high loss proportional to the size of its population. Yellow-billed Loons were found on more lakes in 1989 than in 1972 in the region considered to be the prime breeding grounds for Alaska's Yellow-billed Loons. This raises questions of whether or not the wintering loons of Prince William Sound represent Alaska's breeding population, or if they are individuals that breed elsewhere. Maps of prospective alternative breeding sites will be shown. Distribution analysis for the three loon species breeding on the North Slope will be explained, and the data analysis completed to date will be shared.

THE EFFECT OF EXPERIMENTALLY ALTERED CLUTCH SIZE ON GROWTH IN PIGEON GUILLEMOT CHICKS

McLaren, E. (Oregon Inst. Marine Biology, Univ. Oregon, Charleston, OR 97420)

The effect of experimentally altered clutch size on growth rates in Pigeon Guillemot chicks was measured during the breeding season of 1989. Pigeon Guillemots are capable of rearing two semi-precocial chicks, however in some years, females lay only one egg. This strategy reduces the energy demands placed on adults and may be utilized by inexperienced or unfit birds. In order to determine whether adults which lay one egg are capable of rearing two chicks, eggs from nests containing one egg were switched with eggs from nests containing two eggs. To observe potential differences in the growth rates of these chicks, measurements of weight, wing, culmen and tarsus lengths were taken from hatching until fledging (31-39 days), and compared to chicks from control nests. No significant differences in mortality or growth rates of chicks originating from altered clutches were observed. These results suggest that the limiting factor in the clutch size of Pigeon Guillemots is not a function of the energetic requirements of rearing one versus two chicks.

SEABIRD DISTRIBUTION IN THE KURIL ISLANDS, U.S.S.R.

Merrick, R. L. (National Marine Mammal Laboratory, Alaska Fisheries Science Center, 7600 Sand Point Way NE, Seattle, WA, USA 98115), M. K. Maminov (TINRO, Shevchenko Alleye, 4, Vladivostok, USSR 107140)

Small boat surveys of seabird distribution and abundance were made (as an adjunct to marine mammal surveys) throughout the Kuril Islands during June and July 1989. We observed 22 different sea bird species during our surveys of 13 of the islands. At least nine species were observed nesting. With the exception of Slaty-backed Gulls and Japanese Cormorants, the composition of the Kuril Island bird fauna was similar to that of the Aleutian Islands. The

most abundant seabird species were Northern Fulmars, Slaty-backed Gulls, and Tufted Puffins. These were observed in large numbers at most islands. Raykoke Island supports the largest Northern Fulmar colony in Soviet waters and also had the largest Parakeet Auklet and Crested Auklet colonies observed by us during the cruise. The second most common group of birds were those observed in the kelp beds or immediately near shore and included Red-faced Cormorants, Pigeon Guillemots, and Harlequin Ducks.

SURVEY OF MARBLED MURRELETS FROM SHORE IN NORTHWESTERN CALIFORNIA

Miller, S. L., C. J. Ralph, B. O'Donnell (U.S.F.S. Redwood Sciences Laboratory, 1700 Bayview Drive, Arcata, California 95521)

The objective of this study was to determine efficacy of land based methods of counting Marbled Murrelets from shore. We established five transects along the coast of northwestern California. Transects consisted of between three and six fixed stations, with each station providing a clear view of adjacent nearshore waters. We will discuss surveys between May and August 1989, with each transect usually censused four times each month. A station survey usually took 20-60 minutes, depending on area surveyed, sea and weather conditions, and number of birds within the grid. We compared the average number seen between 200 m increments out from shore. Overall density was fairly constant at all stations counted. We found higher densities in areas where sandy beaches met rocky coasts. Depending upon elevation of the observers, they were able to accurately count out to about 600-800 m from shore. This method holds promise for providing good coverage of areas where boat access is difficult.

BEHAVIOR OF MARBLED MURRELETS AT TWO TREE NESTS IN CENTRAL CALIFORNIA

Naslund, N. L. (Inst. Marine Sciences, Santa Cruz, CA 95064), J. L. Schear (Merrill College Box 771, Univ. California, Santa Cruz, CA 95064), D. P. Costa (Inst. Marine Sciences, Univ. California, Santa Cruz, CA 95064)

Preliminary results of a behavioral study of Marbled Murrelets at two tree nests will be presented. Daily activity patterns and associated behaviors are based on over 400 hours of video recorded observations at one nest and are supplemented with sampling of activity by observations through a spotting scope at the other nest. This represents the first detailed study of the nesting behavior of the Marbled Murrelet. Daily activity patterns and associated behaviors will be described. These include incubation exchanges, incubation and brooding behaviors, chick feeding behavior, chick activity, and defence against predators. Variations in activity patterns associated with weather conditions, changes in daylength, stage of the nesting cycle, as well as individual variation between members of each pair were observed and will be reported.

A PROPOSED GROUND SEARCH TECHNIQUE FOR FINDING TREE NESTS OF THE MARBLED MURRELET IN OPEN CANOPY FORESTS

Naslund, N. L. (Inst. Marine Sciences, Univ. California, Santa Cruz, CA 95064), S. W. Singer (City Museum of Natural History, 1305 E. Cliff Dr., Santa Cruz, CA 95062), S. Singer (218 Nevada Street., Santa Cruz, CA 95060)

Two tree nests of the Marbled Murrelet were found while developing a ground search technique for locating such nests. The technique used and improvements to the technique based on data taken at the nests will be presented. Important factors regarding the identification of trees potentially suitable for nesting and delineation of areas where murrelets display the flight and vocalization patterns associated with nest trees will be addressed. The results of intensive observations on the peak activity period at dawn, incubation exchange and food delivery behavior, and key daily activity patterns that may influence the likelihood of finding a nest will be discussed. Though the proposed ground search technique is best suited for relatively open canopy old-growth forests, derivations of it may also prove useful in other forest conditions.

ARE RATS THE CAUSE OF THE MURRELET AND FALCON DECLINES AT LANGARA ISLAND?

Nelson, R. W. (4218 - 63 Street, Camrose, AB T4V 2W2, Canada)

The very large numbers of Ancient Murrelets and over 20 pairs of Peregrine Falcons nesting on Langara Island, B.C., declined drastically in the late 1950s-early-mid-1960s. In 1968-1989 the island held 5-7 pairs of falcons, 7 pairs recently, with normal adult survival and productivity. Murrelet estimates were: 1950s - "astronomical," 1971 - 80-90,000 pairs; 1981 and 1988 - 20-25,000 pairs. Rat predation on murrelets may have caused the declines. Rats may have invaded during the early sea otter fur trade or during lightstation (beginning in 1911), commercial fishing and packing, and military training (WWII) activities. The initial major murrelet decline and the falcon decline followed a period of ocean warming (1957-1958), and occurred when substantial levels of biocides were present in the NE Pacific and when the local decline of salmon caused the commercial fishery to be severely tightened. These three oceanic factors, plus the less well documented histories of nearby seabird and falcon populations are shown to suggest that rat-caused mortalities may be relatively incidental to the Langara murrelet and falcon declines. A proposed rat control program will be a most valuable experiment.

DISTRIBUTION OF THE MARBLED MURRELET IN WESTERN OREGON

Nelson, S. K. (Oregon Cooperative Wildlife Research Unit, Oregon State University, Corvallis, Oregon 97331)

Surveys for Marbled Murrelets were conducted between 15 May and 15 August 1989 to determine the species' distribution in inland coniferous forests of the Oregon Coast Ranges. Road transects were established in three habitat types (tree size classes: 25-45 cm, 46-81 cm, >82 cm), and were distributed as evenly as possible from north to south and east to west (up to 60 km inland) within the study area. Murrelets were detected along 77 of 137 (56%) transects. Most (>60%) transects with murrelets occurred within 35 km of the ocean and adjacent to the larger tree size classes. No detections were

recorded in areas that were highly fragmented, including the northern coast and areas >40 km inland in the central Coast Range. Sixteen forest stands were identified as potential nest sites through the observation of murrelets landing or flying into trees. Habitat characteristics of these areas will be summarized.

BEHAVIOUR OF PROSPECTING THICK-BILLED MURRES: EFFECTS OF AGE AND CONDITION

Noble, D. G. (Dept. Biology, Queen's University, Kingston, Ontario K7L 3N6, Canada)

Factors affecting the process of recruitment in Thick-billed Murres were studied on Coats Island, Northwest Territories. I looked for correlations among behavioural and morphological traits of known-age birds, particularly with respect to age, experience and condition. During the breeding season, weight and condition, but not linear measurements, were significantly influenced by age. Among pre-breeders, attendance at the site increased with age and weight, but these effects were confounded by the greater site-attachment of older birds. There was a tendency for older birds to initiate interactions, and for those interactions to escalate to fights, more often. Birds of all ages were observed copulating. However, females appeared to become receptive to copulatory advances at a younger age than males were able to achieve cloacal contact. A small number of three and four year olds laid eggs, but almost all of them failed to fledge a chick. These results are discussed with respect to hypotheses for deferred breeding in seabirds.

MARBLED HURRELET BEHAVIOR DURING THE BREEDING SEASON AT INLAND SITES IN NORTHWESTERN CALIFORNIA

O'Donnell, B. P., C. J. Ralph, S. L. Miller (U.S.F.S. Redwood Sciences Laboratory, 1700 Bayview Drive, Arcata, California 95521)

We determined the behavior of Marbled Murrelet at inland breeding groves at eleven locations in the coastal, old-growth redwood (*Sequoia sempervirens*) forests of northwestern California. Four-point grids or single-point stations were established at the sites and surveyed once weekly between May and August 1989. Surveys began 45 minutes before official sunrise, continuing for 75 minutes after sunrise or until 15 minutes beyond the last detection, whichever came last. We will discuss daily and seasonal variations in behavior and use of the forest stands and factors influencing the activity levels and detectability. We found that behavior changed markedly during the breeding season and that this was correlated with apparent changes in the breeding cycle of the species.

MARINE BIRDS AND TOXIC CHEMICALS IN THE TEMPERATE NORTH PACIFIC

Ohlendorf, H. M. (U.S. Fish and Wildlife Service, c/o Dept. of Wildlife and Fisheries Biology, Univ. California, Davis, CA 95616), D. M. Fry (Dept. Avian Sciences, Univ. California, Davis, CA 95616), D. W. Anderson (Dept. Wildlife and Fisheries Biology, Univ. California, Davis, CA 95616)

Marine birds are exposed to a wide variety of natural and synthetic chemicals such as oil, organochlorines, and trace elements that are potentially toxic. Oil spills at sea present high risk to marine birds, particularly alcids. Recent research has attempted to determine 1) risk

factors for different species and geographic populations and 2) physiological effects of oil exposure, including studies of stress, thermoregulation, hemolytic anemia and adverse effects on reproduction. However, the adverse physiological effects of oil exposure are not well understood. Because of their persistence and widespread occurrence, organochlorine compounds such as DDE, PCBs, and some of the more recently used pesticides remain a continuing concern from some marine birds. This is especially true for birds high in the trophic web and those feeding near point sources of contamination. Among the trace elements, cadmium, mercury, and selenium have been found in tissues of marine birds at concentrations that cause adverse effects in other species. Unlike many other carnivorous marine animals, birds typically do not have equimolar concentrations of mercury and selenium in their livers. Interactions among various trace elements (and other factors also) can influence toxicity.

HABITAT USE PATTERNS OF MARBLED MURRELETS AT INLAND SITES IN CALIFORNIA

Paton, P. W. C., C. J. Ralph (U.S.F.S. Redwood Sciences Laboratory, 1700 Bayview Drive, Arcata, California 95521)

We conducted transect surveys at 170 sites during 1988 and 1989 to determine the habitat use patterns of Marbled Murrelets in California. A total of 3,697 10-min stations were surveyed, with murrelets detected on 74 of 170 (44%) transects. Murrelet distribution was patch in the state with concentrations in Del Norte, Humboldt, San Mateo, and Santa Cruz counties. State and National parks had the highest activity levels, 1.0 detection/station. Transects in forested areas dominated by old-growth had the relatively high activity levels, 1.07 detections/station, while transects in second-growth forests had 0.03 detections/station.

NEW CAPTURE TECHNIQUES FOR MARBLED MURRELETS

Paton, P. W. C. Paton, J. Seay, AND C. J. Ralph (U.S.F.S. Redwood Sciences Laboratory, 1700 Bayview Drive. Arcata, California)

Researchers have primarily used cannon-net guns from high-speed inflatable boats to capture Marbled Murrelets for radio telemetry work. During the 1989 field season, we placed a mist net 45 m high in the canopy along a stream corridor in an area with constant murrelet activity. The net measured 20 by 10 m and could easily be raised or lowered. A total of 3 murrelets were captured using this net and equipped with radio transmitters. In addition, we captured one murrelet at night on the ocean with a fish net on the end of 4 m long pole, using a hand-held spotlight from a 20′ Boston Whaler. These two techniques offer researchers two new methods to capture this elusive seabird for further studies.

REPRODUCTIVE PRODUCTIVITY OF GLAUCOUS-WINGED GULLS ON EGG ISLAND, 20 KM SOUTH OF CORDOVA, ALASKA, FOLLOWING THE EXXON VALDEZ OIL SPILL OF MARCH 24, 1989

Patten, S. M. (Div. of Wildlife Conservation, Alaska Department of Fish and Game, P.O. Box 90, Bethel, Alaska 99559)

Glaucous-winged Gulls are among the most numerous species of birds in Prince William Sound. Approximately 50,000 Glaucous-winged Gulls use Prince William Sound in the summer, and lesser numbers are present the year round.

They survive primarily by scavenging and foraging in the intertidal and littoral areas. After the *Exxon Valdez* oil spill, a high percentage of Glaucous-winged Gulls observed had been oiled. Existing literature indicates that small amounts of injested crude oil inhibit gull chick growth and affect osmoregulation, hepatic, and adrenal gland activity. Existing literature also demonstrates that minute quantities of North Slope Crude oil are toxic to gull embryos. Transfer of oil from adult gull breast feathers to eggs will likely cause embryo mortality. Previous research has verified that most of the Glaucous-winged Gulls frequenting Prince William Sound come fram Egg Island and smaller colonies such as Perry Island within the Sound. The Egg Island colony, located about 25 km from Prince William Sound, is the largest Glaucous-winged Gull colony in the world. This project is replicating prior studies of Glaucous-winged Gulls on Egg Island to determine if the *Exxon Valdez* oil spill injured the population or its long-term reproductive viability. The Principal Investigator has collected data on numbers of breeding pairs, nest density, clutch size, hatching success, and fledging success, using identical methods as in prior studies on Egg Island and other sites in southern Alaska. Results are compared directly to other previous data sets from Egg Island and other sites in southern Alaska from gas and oil baseline studies conducted well before the *Exxon Valdez* oil spill.

WASHINGTON BEACHED BIRD CENSUSES

Peabody, B. (Adopt-A-Beach, 710 2nd Ave, Suite 730, Seattle, WA 98104)

Beached bird censuses were conducted in California over a period of fourteen years during the 70s and early 80s in response to a series of major oil spills. Census data provided baseline information for damage assessment studies in the wake of these spills, and led directly to legislation banning gill net fishing in the gulf of the Farallones. Adopt-a-Beach has since initiated a similar volunteer beached bird census program at 23 beaches on the outer coast, along the Strait of Juan de Fuca, and in Puget Sound. A network of statewide and regional coordinators assures volunteer coverage and quality control. A committee of agency staff and researches reviews project design and data records and/or assists with training. Dedicated coordination is the key to maintaining and developing the interest and involvement of volunteer monitors. Initial funding for coordination is provided by the Department of Ecology through a Coastal Zone Management grant. To date, over 100 volunteers are involved in the project statewide. Plans for the future include: obtaining support from resource agencies to analyze data and integrate data processing into ongoing resource management studies, assisting resource agencies in assessing the damage of future oil spills through careful and systematic surveys before, during, and after spills, involving industry groups in conducting surveys in designated areas, and securing enough support to continue coordinating the program for no less than 15 years.

IMMEDIATE IMPACT OF THE "EXXON VALDEZ" OIL SPILL ON MARINE BIRDS

Piatt, J. F., C.J. Lensink, W. Butler, M. Kendziorek , D.R. Nysewander (U.S. Fish and Wildlife Service, 1011 E. Tudor Rd., Anchorage, AK 99503; Alaska Department of Environmental Conservation, P.O. Box "0", Juneau, AK 99811).

On March 24, 1989, the oil tanker "Exxon Valdez" spilled 260,000 barrels of crude oil in Prince William Sound, Alaska. Oil eventually drifted over

30,000 km^2 of coastal and offshore waters occupied by about a million marine birds. More than 30,000 dead birds comprising 90 species were retrieved from polluted areas by 1 August, 1989. Of those identified, murres (74%), other alcids (7.0%) and seaducks (5.3%) suffered the highest mortality from oil and most (88%) birds were killed outside of Prince William Sound. A colony of 129,000 murres at the Barren Islands was probably devastated. Between 1 August and 13 October, another 7000 birds were retrieved but most of those birds appeared to have died from natural causes and were comprised largely of shearwaters and other procellarids (51%), gulls (22%), and puffins (14%). Based on aerial and ship-based surveys for populations at risk, and extrapolating from the number of dead birds recovered, we tentatively estimate that the total kill from oil pollution was in the order of 100,000 - 300,000 birds.

AT-SEA SURVEYS OF MARBLED MURRELETS FROM BOATS IN NORTHWESTERN CALIFORNIA

Ralph, C. J., S. L. Miller, And B. O'Donnell (U.S.F.S. Redwood Sciences Laboratory, 1700 Bayview Drive, Arcata, California 95521)

Our objective was to census from a boat to determine observer censusing efficiency and population sizes and trends. During 1989, at three study sites that paralleled from-shore transect areas, we conducted four surveys per month, using 17-20' Boston Whalers. Surveys began as soon after sunrise as sea and fog conditions allowed, and involved a series of 2-km transects parallel to shore for 6-8 km at distances of 400 m, 800 m, 1400 m, 2000 m, and 3000 m from the surf line. Speed was 8-12 knots, adjusting for sea conditions. Observer's ability to view murrelets declined rapidly at distances greater than about 100 m. The peak of murrelet abundance during the breeding season lay somewhat outside of the shore-based observer's view at about 1000 m. While we detected the majority of birds on transects less than 2000 m offshore, birds were still seen at 3000 meters. This fall birds apparently began to move further offshore as the weather became cooler. These aspects will be considered the coming winter of 1989-90.

THE PERUVIAN DIVING PETREL *Pelecanoides garnotii* IN PERU

Riveros-Salcedo, J. C., J. Jahncke Aparicio (APECO, Parque Jose de Acosta 187, Lima 17, Peru)

A survey of the Peruvian Diving Petrel populations, one of the most endangered seabird species in Peru, was conducted during 1988 in some islands off the coast of the Paracas Peninsula. Additionally, a preliminary study of the breeding biology of the species was performed in 1989 at Isla San Gallan, Paracas. The current population of Peruvian Diving Petrels in Peru, based on the counting of active nest sites, is estimated at 1500 individuals. The last colonies are located at Isla San Gallan (13.50'S 76.28'W) and Isla La Vieja (14.17'S 76.12'W). These birds nest all year-round and most of the pairs nest twice a year. The single egg is incubated during approximately 9 - 10 weeks. The rearing period ranges from 60 to 70 days. Brooding lasts around two weeks and both of the parents feed the chicks each night until it fledges. Flight activity around nests occurs early in the morning before sunrise and at dusk to avoid diurnal predators as Peregrine Falcons and Kelp Gulls. Growth rate of the chicks fits a logistic curve with the following parameters: K = 0.104, asymptote = 250 g, and t_{10-90} = 42.1 days. Breeding success, calculated independently as hatching success (45.4%) and fledging success (73.7%), was

33.4%. Chick mortality was higher during the two first weeks of life. The main threat to the Peruvian Diving Petrel populations in Peru is human disturbance due to poaching by guano harvesters and eventually, fishermen. It is necessary to improve enforcement around the last breeding colonies to ensure the future of the species.

MARINE BIRD DISTRIBUTION IN THE BERING SEA AS DETERMINED BY PHYSICAL AND BIOLOGICAL PROCESSES

Schneider, D. C. (Ocean Science Centre, Memorial University of Newfoundland, ST. John's, Nfld A1B 3X7, Canada)

Current knowledge of seabird distribution in relation to biological and physical processes in the Bering Sea is reviewed within a dimensionally consistent framework. This review updates those of Hunt et al. (1981) and Gould et al. (1982), with emphasis placed on recent quantitative results. Part 1 lists range, seasonal movements, foraging style, diet, and estimates of population size of regularly occurring species. Part 2 describes physical and biological processes affecting distribution. The importance of spatial scale is evaluated relative to two dimensionless ratios, one expressing the importance of locally density dependent processes, the second expressing the relative importance of fluid and locomotory motions of marine birds and their prey. Part 3 contrasts the importance of tidal processes (eastern Bering Sea) and advective processes (western Bering Sea), based on research in the Anadyr Current and in the vicinity of tidal fronts. Part 4 lists recommendations for future work.

MARBLED MURRELETS: DO THEY GROUND NEST IN THE OLYMPIC MOUNTAINS OF NORTHWEST WASHINGTON?

Sharpe, F. A. (Olympic National Park, Natural Sciences Division, 600 E. Park Ave., Port Angeles, WA 98362)

The Olympic Mountains include the lowest and most southerly alpine habitats along the Pacific coast within the southern portion of the Marbled Murrelet's range. In the northeast Olympics, alpine habitats range from 4,500 - 6,500 feet in elevation and occur frequently within 12 miles of tidewater. The objective of this study was to determine if there is any evidence of murrelets ground nesting in timberless areas or following flight corridors across sub-ranges of the Olympic Mountains to access interior forest stands. Searches for murrelets in high country areas was initiated by: 1) the need to inventory potential murrelet habitat on both National Park and National Forest lands; 2) Dawson's (1923) unconfirmed report of murrelets "nesting in burrows on some of the higher slopes of the Olympic Mountains;" 3) previous detections of murrelets at interior habitats on the Olympic Peninsula; and 4) assertions that the species' ability to ground nest will always ensure adequate murrelet habitat on the Olympic Peninsula. Four fixed survey stations were selected: each was monitored on three different mornings and evenings from June - August in 1988 and 1989. Morning censuses began 30 minutes before official sunrise and stopped 90 minutes after sunrise; evening censuses were conducted for three hours beginning at sunset. Fifty-four hours of ground searches were also conducted. During this study, there were no detections of Marbled Murrelet associated with, or crossing alpine areas. Movements of Marbled Murrelet on the Olympic Peninsula appears to be generally below 2,500 feet and restricted primarily to valley bottoms and

river corridors. All lowland sites where Marbled Murrelet were detected possessed forested areas further up valley.

OCTOPUS PREDATION ON SEABIRDS

Sharpe, F. A. (Olympic National Park, Div. of Natural Sciences, 600 E. Park Ave, Port Angeles, WA 98362), M. A. Kyte, W. A. Kyte, M. Kyte (Ardea Enterprises, 11025 4th Street SE, Snohoomish, WA 98290)

Octopus are the most intelligent of the invertebrates. They exhibit individuality and engage in complex behaviors including defense of mates, guarding of food sources, and development of prey preferences. The diet of the Giant Pacific Octopus (*Octopus dofleini martini*) includes crabs, bivalves, and to a lesser extent, fish, snails, and echinoderms. Seabird remains are occasionally found in octopus middens, but it is not known if these are the result of predation or scavenging. Observations of direct predation on seabirds was observed at Whidbey Island, Washington during June 1988. At this location an octopus denning below the end of a submerged concrete boat ramp was observed capturing a Glaucous-winged Gull and a Pigeon Guillemot on separate occasions. Both birds were located at the surface near the entrance of the den and were observed struggling frantically as they were pulled under by the arms of an octopus. Predation on seabirds by wild octopus is apparently a rare event which may be aided by human modification of shorelines. The presence of jetties, boat ramps, and discarded materials apparently has created additional denning opportunities for octopus in shallow water environments, and perhaps has made seabirds more accessible to this predatory cephalopod.

HOLOCENE DISTRIBUTIONS OF ALEUTIAN SHAGS AND CORMORANTS

Siegel-Causey, D. (Museum of Natural History, Univ. Kansas, Lawrence, KS 66045-2454)

Recent excavation of Aleut kitchen middens on Amchitka Island allowed me the opportunity to assess the population history of shags and cormorants in the Rat Islands. The midden material dates from 2600 ybp to colonial times and comprises about 3000 phalacrocoracid bones. The most numerous species in this species are the Pelagic and Red-faced shags; the relative proportion of these two remain the same throughout the Holocene. Double-crested Cormorants were present throughout this time period, but never were greater than about 5% of the total. I found an associated synsacrum and femur of the Japanese Cormorant, and a carpometacarpus of the Spectacled Cormorant (now extinct), both dating from about 2250 ybp. In addition, throughout the entire midden material, I found 109 elements belonging to a very small shag closely related to the Red-faced Shag. I discuss the systematic and biogeographic relevance of this material.

DISTRIBUTION,STATUS, AND ECOLOGY OF CORMORANTS AND SHAGS OF THE NORTH PACIFIC

Siegel-Causey, D. (Museum of Natural History, Univ. Kansas, Lawrence, KS 66045-2454), N. M. Litvinenko (Inst. Biology, Far-East Science Center, Vladivostok, USSR)

Cormorants and shags of the North Temperate Pacific are a diverse group of moderate-sized seabirds restricted to neritic and littoral waters. Seven species are represented in this region and comprise four broad ecological groups. Mesocormorants (Double-crested, Olivaceous) feed in marine and aquatic littorals throughout the New World, but only the first is common in the region. Double-crested Cormorants extend from Southern California to Southeast Alaska with the predominant marine populations found adjacent to the California Current. Macrocormorants (Great and Japanese) are restricted to the temperate western shores of the Pacific basin and only the Japanese Cormorant is abundant in marine environments. Brandt's Cormorants are exclusively marine and are found most often near strong upwelled water. Its greatest abundances are centered on the Farallon Islands. As a group, cormorants feed on- and offshore, and prefer to feed at moderate depths and near bottom close to land. In contrast, shags of the North Pacific (Red-faced, Pelagic) feed in the upper water column and near land, and prefer to nest on steep cliffs and inaccessible sites. Dispersal is greatest of all in the latter species, which is found throughout the North Temperate Pacific. Cormorant populations (and interactions with humans) are increasing, but for reasons yet unknown. Management strategies differ widely among regions and are inadequate or inappropriate.

CORRELATES OF PELAGIC DISTRIBUTION OF SEABIRDS IN THE SEA OF OKHOTSK

Siegel-Causey, D. (Museum of Natural History, Univ. Kansas, Lawrence, KS 66045-2454) and V. P. Shuntov (T. I. N. R. O., Far-East Science Center, Vladivostok, USSR)

The Okhotsk and Bering Seas have comparable levels of productivity, but the distribution patterns of seabirds differ greatly. Similar to the Bering Sea, the greatest concentrations of seabirds in the Okhotsk Sea are found over shelf waters, but unlike it these areas are coastal, over continental slopes and island shelfs. Ninety percent of the Okhotsk Sea is oceanic and strong upwelling is restricted to northern and eastern coastlines. Nutrient injection of surface waters is further enhanced by high continental runoff and gyral recirculation. Geographic features cause climatic conditions similar to polar seas, and the only sections remaining ice-free are the waters off the Kuril Islands and the western coast of Kamchatka. Winter residents are primarily diving birds concentrated along the southern ice edge and the southwestern coast of Kamchatka. Summer distributions at sea are associated with gyral concentrations of high productivity offshore near breeding colonies. A large resident population never breeds and aggregate instead near oceanic fronts, orographic upwelling, and in the south, continental plumes. Seasonal change in abundance and diversity seem more related to large-scale ecological processes than to specific features of the region.

THE EFFECT OF PLASTIC INGESTION ON GROWTH AND SURVIVAL OF ALBATROSS CHICKS

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The effect of ingested plastic on the growth and survival of chicks of Laysan albatrosses and Black-footed albatrosses on Midway Atoll was studies during the nesting seasons of 1986 and 1987. The weight and proventricular content of the chicks was determined periodically through the nesting cycle. Large (>22 cc) volumes of plastic were present in the proventriculi of 27% of the Laysan and 16% of the Black-footed chicks regurgitated pellets composed of plastic and other indigestible material from their proventriculi. Laysan chicks with large volumes of proventricular plastic had asymptotic fledging weights significantly lower (122 g) than chicks with low amounts of plastic. The effect of depressed fledging weights on post-fledging survival was not determined. Plastic had no detectable effect on the growth of Black-footed chicks. All chicks from the study which died were examined by necropsy. Ingested plastic was the cause of death of one of 45 Laysan chicks examined in 1986, but was not involved in the cause of death of 93 individuals examined in 1987. Dehydration was the most common cause of death. In general ingested plastic did not seem to be an important cause of death in nestlings in either year during this study, but the bulk of the data were collected in 1987, when the average volume of plastic in the chicks was lower than earlier years.

DISCOVERY OF TWO TREE NESTS OF THE MARBLED MURRELET

Singer, S. W. (Santa Cruz City Museum of Natural History, 130S East Cliff Drive, Santa Cruz, CA. 95062), N. L. Naslund (Institute of Marine Sciences, University of California, Santa Cruz, CA. 95064), S. A. Singer (218 Nevada Street, Santa Cruz, CA. 95060), C. J. Ralph (U.S.F.S. Redwood Sciences Laboratory, Arcata, CA)

Two nests of the Marbled Murrelet were found in old growth Douglas-fir trees in Big Basin Redwoods State Park, Santa Cruz County, California. The third and fourth known North American tree nests, these were the first to be found by ground searching without radio telemetry. Both nests were in the incubation stage when found. Each was observed from a distant, non-disruptive location for 14 days and 33 days, respectively. Twenty-four hour incubation shifts were confirmed with the adults exchanging duties at dawn. Flight access corridors and flight behavior to and from the nests were determined. After corvid predation caused both nests to fail, each tree was climbed and data collected. Both nests were located in the inner canopy, mid-crown portion of the trees. One nest was a previously undescribed type of constructed nest made up of small Douglas-fir twigs and foliose lichens. The other nest was a natural depression in a moss-covered limb. Eggshell fragments are similar to previously described eggs. Almost all droppings were confined to the one nest that had progressed to the chick stage. Nest site characteristics are compared to characteristics of the other known North American tree nests.

DISCOVERY OF TWO TREE NESTS OF THE MARBLED MURRELET

Singer, S. W. (Santa Cruz City Museum of Natural History, 130S East Cliff Drive, Santa Cruz, CA. 95062), N. L. Naslund (Institute of Marine Sciences, University of California, Santa Cruz, CA. 95064), S. A. Singer (218 Nevada Street, Santa Cruz, CA. 95060), C. J. Ralph (U.S.F.S. Redwood Sciences Laboratory, Arcata, CA)

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WEST COAST OF NORTH AMERICA SEABIRD COLONY CATALOG - A DESKTOP ANALYSIS AND RETRIEVAL SYSTEM

Sowls, A. (US Fish and Wildlife Service, 202 Pioneer, Homer, AK 99603), G. Divoky (Inst. of Arctic Biology, Univ. Alaska, Fairbanks, AK 99701), E. Archer, T. La Pointe (NOAA, 11400 Rockville Pike, Rockville, MY 20852), G. Kaiser (Canadian Wildlife Service, PO Box 340, Delta, B.C., Canada Z4K 3Y3)

While most seabird colonies on the west coast of North America have been censused, little attempt has been made to compile this information over state and national boundaries. The US Fish and Wildlife Service is gathering the most recent information from all colonies along the west coast states. Cooperation with the Canadian Wildlife Service provides coverage for British Columbia. A desktop data retrieval and analysis system, developed by the National Oceanic and Atmospheric Administration, provides the ability to obtain information on specific colonies or to examine large scale patterns. Distribution of data files will allow faster use of updated colony data. Files containing species information on breeding chronology, success, foraging ranges, and prey allow anticipation of impacts of pollution etc., near colonies. A prototype system is available during the meeting and suggestions for improvements are requested

THE STATUS AND ECOLOGY OF PLANKTIVOROUS ALCIDS OF THE TEMPERATE NORTH PACIFIC OCEAN

Springer, A. M. Springer[1], A. Y. Kondratiev[2], H. Ogland[1], Y. Shibaev[3], and G. B. Van Vliet[1] ([1]Inst. Marine Sciences, Univ. Alaska, Fairbanks, AK 99775; [2]Inst. Biological Sciences of the North, Karl Marx Str 24, 685010 Magadan, USSR; [3]Inst. Biology and Soil Sciences, USSR Academy of Sciences, Vladivostok 690022, USSR)

The group "planktivorous alcids" includes the Ancient and Japanese murrelets, Cassin's, Parakeet, Crested, Whiskered, and Least auklets. None of these species is strictly planktivorous, but only the murrelets and Parakeet Auklet feed on a large quantity of fish in addition to zooplankton. As a group, these species breed around the North Pacific rim and its marginal seas wherever suitable nesting habitat and sufficient prey are found. They consume primarily euphausiids and large species of calanoid copepods that are most abundant in oceanic and deeper shelf regions, and only the Parakeet Auklet nests in shallow shelf environments without access to such prey. Although the ranges of all but the Japanese Murrelet overlap broadly, geographic patterns of species distribution are still clear. The overall distribution of the planktivorous alcids probably has changed little in the past two centuries, but numbers at many specific locations have changed greatly. Expanding populations at some colonies and declines and extinctions at others point to several factors that are important to the population dynamics of these birds, such as predation by introduced mammals, loss of nesting habitat, and a changing prey base.

TRANSIENT KILLER WHALE (*Orcinus orca*) HARRASMENT, PREDATION, AND "SURPLUS KILLING" OF MARINE BIRDS IN BRITISH COLUMBIA

Stacey[1], P. J., R. W. Baird[2,3], A. B. Hubbard-Morton[4] ([1]The Whale Museum, Friday Harbor, WA; [2]Box 6244, Victoria, B.C. V8P 5L5; [3]Dept. Biological Sciences, Simon Fraser Univ., Burnaby, B.C. V5A 1S6; [4]Raincoast Research, Simoom Sound, B.C. V0P 1S0)

Observations of transient killer whale attacks on marine birds around Vancouver Island are presented. All the attacks appear to have been on birds which were molting and unable to fly. Attacks include killer whales tail-lobbing, chasing and jumping on the birds. Attack outcomes include the bird being left alone after the encounter either unharmed, wounded or dead, or disappearing and presumably being eaten. One positive observation of consumption was recorded. Birds react to the attacks by swimming at the surface; they have not been seen to dive. All attacks were on birds at the surface, although it is possible that attacks may occur on birds below the surface but were not observed. Attacks on marine birds have been previously reported in the literature and their remains have also been reported from stomach contents of transient killer whales. These interactions appear to be energetically inefficient for the killer whales, compared to observations of predation on marine mammals. We have observed transient killer whales interact with the Common Loon, Eared Grebe, Common Murre, Pigeon Guillemot, and Rhinoceros Auklet. We discuss possible reasons for interactions, including "play" and "surplus killing," and the potential for impacts on marine bird populations.

KLEPTOPARASITISM BY HEERMANN'S GULLS ON BROWN PELICANS AND TERNS

Tershy, B. R. (Section of Neurobiology and Behavior, Mudd Hall, Cornell Univ., Ithaca, NY 14853), D. Breese (Environmental Field Program, Univ. California, Santa Cruz, CA 95064), G. M. Meyer (Field Studies Group, 1903 N. Coolidge Ave., Altadena, CA 91001)

Three aspects of Heermann's Gull kleptoparasitism of Brown Pelicans and terns (Sterna elegans and S. maxima) were examined in the Gulf of California, Mexico between April 1985 and April 1986: 1) the frequency of attempted kleptoparasitism by immature vs. adult Heermann's Gulls; 2) the frequency of attempted kleptoparasitism by adults, from immature vs. adult Brown Pelicans (in relation to the relative foraging success and availability of these two age classes); and 3) the frequency of attempted kleptoparasitism by adults from Brown Pelicans vs. terns. 1) No significant difference was found in the frequency of kleptoparasitic attempts by immature vs. adult Heermann's Gulls. 2) Immature Brown Pelicans dived more frequently and had lower foraging success than did adults and adult Heermann's Gulls made more kleptoparasitic attempts on adult Brown Pelicans. 3) Adult Heermann's Gulls made more kleptoparasitic attempts on terns than on Brown Pelicans. We conclude that immature and adult Heermann's Gulls attempt kleptoparasitism with equal frequency and that adults are sensitive to differences in the foraging success of potential victims.

SEABIRD DISTRIBUTION AND ABUNDANCE IN RELATION TO OCEANOGRAPHIC PROCESSES IN THE CALIFORNIA CURRENT

Tyler, W. B., D. B. Lewis (Long Marine Lab, Univ. California, Santa Cruz, CA 95064), K. T. Briggs (School of Veterinary Medicine, Univ. California, Davis, CA 95616), G. Ford (ECL Corp., Portland, OR)

The broad, slow, cool, southward-flowing California Current dominates hydrography along the west coast of North America from the United States-Canada border to the southern tip of the Baja peninsula, out to 500 or 1000 km offshore. This current system supports about 70 species of seabirds. The predominant faunal elements are the local breeders, migrants and winter visitors from more northerly colonies, and summer visitors from the Southern Hemisphere. The California Current system covers several sub-regions. The central sub-region (Cape Blanco to Pt. Conception) features strong year-round upwelling and very large populations of nesters (especially alcids) and summer visiting shearwaters. Farther south, upwelling is seasonal and localized, and seasonal elevation of sea surface temperatures coincides with increased numbers of tropical species. North of Cape Blanco, upwelling is less intense and colonies are smaller (except near the Olympic Peninsula); the offshore fauna is transitional between those of the central sub-region and the Gulf of Alaska. In this paper, we identify and discuss oceanographic features of fine through macro scales, both spatial and temporal, that affect the pelagic distribution and abundance of seabirds within each sub-region. Features include seasonal patterns of current flow and nutrient/prey distribution, topography, evolution and orientation of upwelling filaments, effects of optical clarity and thermocline depth on diving birds, and reliance on thermohaline fronts by surface feeders.

STATUS, CONSERVATION AND MANAGEMENT OF NESTING *Larus* GULLS IN THE NORTH PACIFIC OCEAN

Vermeer, K. (Canadian Wildlife Service, c/o Inst. Ocean Sciences, P. O. Box 6000, Sidney, B. C. Canada V8L 4B2), D. G. Irons (U. S. Fish and Wildlife Service, 1011 E. Tudor Road, Anchorage, AK 99504), E. Velarde (Inst. de Biologia, Dept. de Zoologia, Apartado Postal 70-153, Mexico 04510 D. F. Mexico),Y. Watanuki (Natl. Inst. Polar Research, 19-10, Kaga 1-Chome, Itabashi-Ku, Tokyo 173, Japan).

The population status of seven *Larus* species in the North Pacific Ocean, and that of five other gull species, which only maginally nest near saltwater, have been briefly reviewed. The breeding range, nesting habitat, reproductive success and the effects of human disturbance on gulls have also been described. Conservation measures are urged for three species. Heermann's and Yellow-footed gulls, both of which nest in the Gulf of California, Mexico, are seriously threatened by human disturbance, which includes a sardine fishery. Saunder's Gull, which has the smallest population of any gull species in the North Pacific, could become endangered by the construction of a seawall around its coastal nesting marsh in China. Management of a potential problem species, the Glaucous-winged Gull, may become necessary, since the species represents a potential threat to the American Black Oystercatcher (*Haematopus ostralegus bachmani*) by the usurption of the latter's nesting habitat. The Glaucous-winged Gull also has become a nuisance in coastal towns and cities of British Columbia, in which its nesting in roofs of buildings has been rapidly increasing. It is recommended that an international census of all gull species in the North Pacific be conducted every 10 years to monitor changes in their populations, and that the behavioural and ecological interactions of the members of the Herring Gull species group be investigated to clarify interspecific relationships of group members.

SEABIRD DISTRIBUTION IN RELATION TO THAT OF FISH PREY

Varoujean, D. H. (Ecological Consulting, Inc., 2735 NE Weidler, Portland, OR 97232 and Oregon Institute of Marine Biology, PO Box 5398, Charleston, OR 97420)

The at-sea distribution of piscivorous seabirds in the North Pacific is described in relation to that of their prey at various oceanographic scales. At mega- to mesoscales (100 - 3000 km) the distribution of surface feeding, plunge diving and pursuit diving seabirds can be attributed to the seasonal distribution of those pelagic and benthic/demersal fishes that make up the principal component of the diet of these seabirds. At these scales fish distributional patterns can be related to seasonally persistent sea-surface thermal and current boundaries, and larger scale convergences and divergences. Coarse-scale (1 - 100 km) distributional patterns of fish are less well understood, but can be attributed, in part, to localized changes in prey abundance, and changes in patterns of dispersion (e.g., diel vertical migration patterns, onshore-offshore movements for feeding and spawning, and current transport of larval and postlarval juveniles). Although the physical processes that determine these patterns are, at this scale, largely chaotic, they are so within definable bounds. Hence, coarse-scale fish spatial variability can be described quantitatively, and a few examples are provided. Based on a limited amount of information about the ability of seabirds to

track fish spatial variability, several testable hypotheses pertaining to the at-sea distribution of piscivorous seabirds at the coarse-scale are presented.

SEABIRD DISTRIBUTION OFF BRITISH COLUMBIA AND WASHINGTON RELATIVE TO PHYSICAL AND BIOLOGICAL PROCESSES

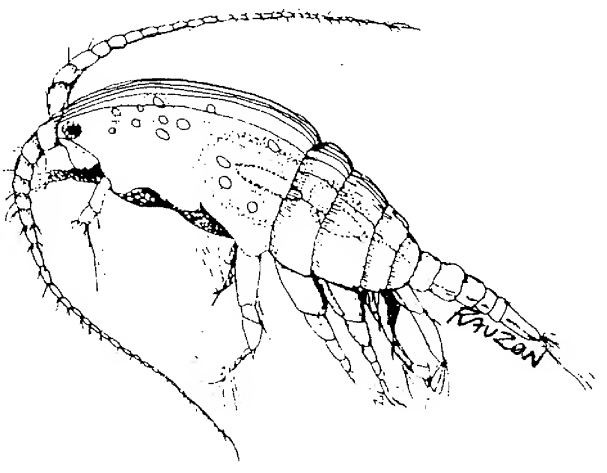
Wahl, T. R. (3041 Eldridge, Bellingham, WA 98225), K. H. Morgan, K. Vermeer (Canadian Wildlife Service, P.O.B. 6000, Sidney, B.C. V8L 4B2).

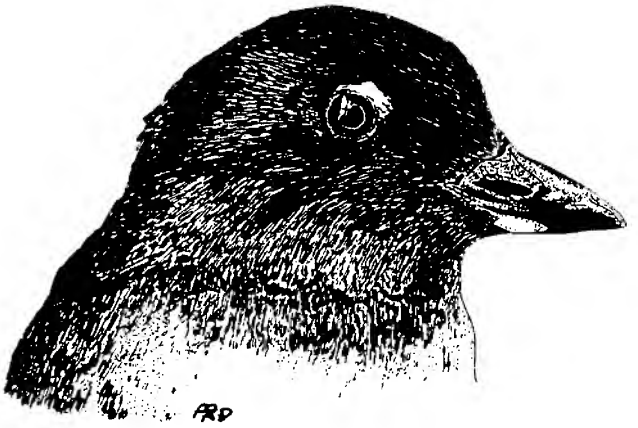
Surveys of British Columbia and Washington offshore seabirds have been limited seasonally and geographically. No direct analysis of distribution and abundance relative to processes have been done, though data suggest associations. Birds appear to concentrate at fronts and outflows, areas of upwelling and seasonal prey concentrations. Overall numbers generally decrease with depth, presumably reflecting productivity and food availability. Numbers appear to vary greatly from year to year, with differences especially noticeable during abnormal oceanographic "events."

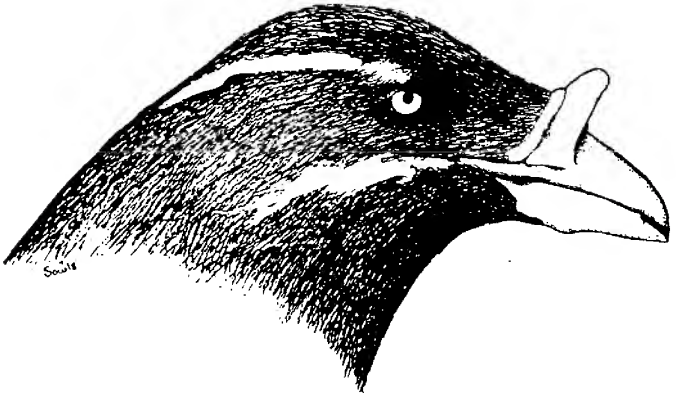
EVOLUTIONARY HISTORY OF SEABIRDS OF THE TEMPERATE NORTH PACIFIC

Warheit, K. I. (Dept. Integrative Biology, 3 Earth Sciences Bldg., Univ. California, Berkeley, CA 94720).

The fossil record of seabirds from the temperate North Pacific is chiefly a record of middle to late Miocene and Pliocene (16.5 _o 1.0 mybp) faunas of southern California. Nevertheless, additional fossil specimens have been discovered from deposits as old as the late Eocene (38 - 42 mybp) of Oregon and the late Oligocene (25 - 30 mybp) of Japan. Pre-middle Miocene faunas consisted primarily of extinct flightless and giant Pelecaniformes (Plotopteridae and Pelagornithidae, respectively). From the middle Miocene through the Pliocene the faunas closely resembled that of present-day species distributions, but with several exceptions: (1) the absence of any marine Laridae or Pelecanidae until the late Pliocene or Pleistocene, respectively; (2) the comparatively low abundance and diversity of cormorants (Phalacrocoracidae) until the late Pliocene; and (3) the extreme diversity and abundance, but subsequent extinction of gannets (*Morus*) and flightless alcids (Mancallinae). Changes in local sea level and temperature, and the evolution and radiation of marine mammals may have been responsible for these patterns.







CENTRAL CALIFORNIA, JEAN E. TAKEKAWA

University of California, Davis

Dan Anderson is involved in the California Department of Fish and Game study on pelican disease interactions and prevalence. He is continuing long-term monitoring studies on the seabirds of the Gulf of California.

Deborah Jaques is finishing her Master's research with Dan Anderson on Brown Pelican communal roosting behavior and habitat use during the nonbreeding period.

Darcy Hu is conducting her Master's research with Dan Anderson on age-related reproduction in Red-footed Boobies.

Pollo Moreno is conducting his Master's research with Dan Anderson on white pelicans on the breeding grounds in northern California and wintering grounds in Mexico.

D. Michael Fry is conducting a toxicity study to examine petroleum and dispersant effects on isolated red blood cells, as a model for hemolytic anemia of seabirds exposed to oil. He investigated different ways of treating birds with hemolytic anemia at rescue centers in Alaska, following the Valdez oil spill. He is also beginning a study on bioaccumulation and toxic effects of dioxin in herons and ospreys, using poultry as model birds.

Kirsten Dahl is conducting her Master's research with Michael Fry on mitochondrial DNA sequencing in Marbled Murrelets and auklets, comparing California and Alaskan populations.

University of California, Santa Cruz

Nancy Naslund, Steve Singer, Stephanie Singer, Gary Strachan, and Robert Burton continue marbled murrelet research in the Santa Cruz Mountains, using ground search techniques to monitor breeding birds.

California State University, Hayward

Sarah Griffin is beginning her Master's research on shorebird ecology in the salt ponds of south San Francisco Bay with Chris Kitting.

Point Reyes Bird Observatory

A. Farallon Islands and Gulf of the Farallones. Bill Sydeman, Steve Emslie, Peter Pyle, and David Ainley continue to monitor breeding seabirds and conduct demographic studies on Western Gulls, Brandt's Cormorants, Cassin's Auklets, and Common Murres on Farallon NWR. They collaborated on the 1989 USFWS survey of seabirds in central and northern California. They are also conducting a study on diet, foraging behavior, and reproductive success in Pigeon Guillemots and Rhinoceros Auklets. New studies are being developed to determine whether Western Gull interference or predation prohibits colony formation by Cassin's Auklets and to attempt to induce Ashy Storm-petrels to

colonize artificial nest sites (boxes) by presenting prospecting birds with vocalizations of conspecifics. Winter attendance by Common Murres and Western Gulls is being investigated. A book by David Ainley and Bob Boekelheide summarizing 13 years of breeding ecology of Farallon seabirds will be published in July 1990. David Ainley and Larry Spear continue to investigate pelagic distribution of seabirds in relation to prey in central California, in conjunction with the National Marine Fisheries Service.

B. Coast and Estuaries. Gary Page, Lynne Stenzel, Dave Shuford, and Janet Kjelmyr continue a shorebird ecology project, coordinating spring and fall shorebird surveys in wetlands in several coastal and interior western states. Staff and research associates continue to monitor breeding success and juvenile dispersal of snowy plovers along Monterey Bay. They are also conducting winter population surveys along the west coast, including Baja California (note: any snowy plover sightings from Baja would be gratefully received).

C. San Francisco Bay. Gary Page, Lynne Stenzel, Dave Shuford, and Janet Kjelmyr are investigating habitat use by shorebirds. Phil Henderson and other staff are investigating breeding success and population levels of Double-crested Cormorants on the Richmond-San Rafael bridge and Farallon NWR.

D. Mono Lake. Jan Dierks, Gary Page, and Dave Shuford continue studying breeding success and population size of California Gulls.

E. Antarctica and Other Regions. David Ainley and Bill Fraser are conducting studies of penguins as indicator species to monitor krill abundance in the Antarctic Peninsula region. Wayne Trivelpiece and Susan Trivelpiece continue demographic studies of penguins at King George Island. David Ainley, Larry Spear, and Bill Fraser continue studies of pelagic seabird communities in the equatorial Pacific and Weddell Sea. Wayne Trivelpiece is investigating the breeding strategy of the Magnificent Frigatebird at Barbuda. David Ainley and Bill Fraser are assessing the impacts of the oil spill resulting from the sinking of the Bahia Paraiso at Palmer Station, Antarctica.

San Francisco Bay Bird Observatory

SFBBO continues to monitor colonial nesting birds in south San Francisco Bay. Jan Dierks is nearing completion of her Master's thesis on chick diet of California Gulls.

USFWS/Northern Prairie Field Research Station - Dixon

Field work was completed in September for a survey of seabird breeding colonies in central and northern California, led by primary investigator Harry Carter. The field team included Deborah Jaques, Craig Strong, Gerry McChesney, and Mike Parker. This is an update of the survey conducted in 1979-1980 by Sowls et al. (1980). Results are currently being summarized. The study was conducted under an interagency agreement with the Minerals Management Service.

USFWS/Pacific Coast Field Station

Harry Ohlendorf continues investigating contaminants and biological effects in wintering waterfowl in San Francisco Bay. Roger Hothem is conducting studies on contaminants and reproductive success in Snowy Egrets and Black-crowned Night Herons in two colonies in San Francisco Bay. Joe Skorupa continues to investigate reproductive success in many species of waterfowl and shorebirds in the Tulare Basin in agricultural drainwater areas.

USFWS/San Francisco Bay NWR

Louise Accurso is conducting her Master's research on the distribution and abundance of wintering waterfowl in San Francisco Bay through Humboldt State University. This project is led by John Takekawa of the FWS Northern Prairie Field Research Station in Dixon. Refuge biologists continue cooperative aerial surveys with PRBO of Common Murre breeding populations at Farallon NWR. Jean Takekawa and other staff assisted on the 1989 USFWS seabird survey by flying aerial surveys of murre and cormorant colonies in central and northern California. Refuge biologists continue contaminant monitoring studies in the Bay and Salinas River NWR.

NORTHERN CALIFORNIA/OREGON, ROY W. LOWE

Oregon State University

S. Kim Nelson is continuing her work with Marbled Murrelets in the Oregon coastal region. Kim is working out of the Oregon Cooperative Wildlife Research Unit and has hired a crew to assist her with the research. In 1988 and 1989 twenty areas were identified as potential nest sites through surveys of young, mature and old-growth forests. Eight to ten of these areas will be monitored for nests during the spring and summer of 1990 using an intensive ground inventory technique. Birds will be observed in an attempt to discover unique behavioral patterns. Murrelet vocalizations will also be recorded in cooperation with research in northern and central California.

University of Oregon

Dr. Jan Hodder and students at the Oregon Institute of Marine Biology will continue studying nesting success of Pelagic Cormorants at the OIMB colony (CC# 270-008) in Sunset Bay. this will be the 18th consecutive year that this colony has been studied.

Elizabeth McLaren. OIMB student, has completed fieldwork for her thesis research on Pigeon Guillemots. The research, conducted in Cool Bay, studied the effects of experimentally altered clutch size on growth, hatching and fledging success.

Humboldt State University

Dr. Rudolf W. Becking is continuing to focus his research efforts on Marbled Murrelets. Primary objectives are to discover nesting trees and document nest habitats. Detailed habitat information will be collected on forest stand structure and tree inventories. Information on nest discoveries

and fledglings will be collated in a data base. Studies of vocalization, plumage and behavior will continue on a limited basis.

Dr. Paul Springer is contenting the long term population, distribution, and ecology study of the endangered Aleutian Canada Goose on their migration and wintering grounds in the Pacific Flyway. Data from over 3,700 banded birds and 70,000 resightings and recoveries are now being analyzed. Even with such a huge data base there are still many gaps in the knowledge of the distribution of the geese after they leave the Aleutian Islands. The Aleutian Canada Goose is slightly larger but somewhat lighter in color than a Cackling Canada goose, weighs about 5 pounds, and has a white neck ring as an adult. Marked birds have blue, yellow, green, or red leg bands with numbers and letters or a combination of both, and some individuals have gray neck collars that are 3/4 inch high with a letter and two numerals. Persons observing Aleutian Canada Geese are urged to contact Paul Springer, Wildlife Field Studies, Humboldt State University, Arcata, CA 95521.

U.S. Forest Service

C. John Ralph working out of the Redwood Sciences Laboratory in Arcata, California is conducting a variety of research on Marbled Murrelets. Associates of this work include Brain O'Donnell, Sherri Miller, Nancy Naslund (forest surveys and nest searches in Santa Cruz County), and Gray Strachan (Shore-based surveys off Año Nuevo Island).

During the spring and summer of 1990 they will be conducting extensive field tests of methods to census offshore populations, and investigate the behavior of the birds both while in nesting groves and while foraging offshore. During the 1989 season they augmented the 1988 state-wide survey, doing work in more second-growth forests. No murrelets were found over extensive areas of Mendocino, Sonoma, and Marin counties on 43 surveys, with some minor exceptions. Old-growth forests are essentially lacking from these areas.

U.S. Fish and Wildlife Service

Roy W. Lowe of the Western Oregon Refuges Complex is continuing seabird monitoring projects in Oregon. Activities in 1990 will include the following. (1) Aerial photographic surveys of all Common Murre, Brandt's Cormorants and Double-crested Cormorant colonies on the Oregon coast. (2) Continue beached bird mortality transects near Newport and co-author a paper on this subject with Range Bayer and Robert Loeffel. (3) Document the departure of Common Murre jumplings from the Three Arch Rocks colonies. (4) Conduct the fourth annual aerial survey of Brown Pelicans in Oregon and Washington and co-author a paper on this subject with Deborah Jaques and Dan Anderson. (5) Conduct nearshore transects of Marbled Murrelets on an opportunistic basis. (6) Conduct colony censuses at various locations along the Oregon coast. (7) Continue spring and fall aerial surveys of Aleutian Canada Goose use of costal rocks in Oregon. (8) Continue working on production of the Oregon Seabird Colony Catalog. Kim Thounhurst will be assisting with fieldwork again this summer.

Intensive monitoring of northern sea lion pupping sites in Oregon will be conducted this year to document harassment of sea lions by commercial urchin divers and substantiate declining numbers of adults and reduced pup

production on Orford and Rogue Reefs. many Goff will be participating in the project conducting shore-based monitoring of the rogue Reef at Gold Beach. Roy and Kim will be conducting observations from small boasts and will conduct aerial photographic surveys three times/day, every two weeks from May through September.

Others

Ebasco Environmental Co. of Bellvue, Washington in conjunction with Ecological Consulting, Inc., is conducting a 3-year study entitled "Oregon and Washington Marine Mammal and Seabird Surveys" off the coasts of Oregon and Washington. Key personnel of this study include John J. Brueggman, Kenneth T. Briggs, Gregory A. Green, Michael L. Bonnell, R. Glen Ford, and Daniel Varoujean. The study has involved developing a synthesis database covering the eastern North Pacific, of all available information on the marine mammals, seabirds, and sea turtles which are known to occur off Oregon and Washington. This study has also completed to date, one shipboard and eight aerial surveys for both marine mammals and seabirds along 32 systematic tracklines extending 100 NM offshore. Another four aerial surveys are planned with completion expected in late summer.. Photographic surveys of seabird colonies and pinniped haulout and rookeries have also been conducted during the late spring through summer periods and will be repeated this year. This project is funded through summer period and will be repeated this year. This project is funded by the Minerals Management Service (MMS).

Robert L. Pitman is continuing a long term study of the reproductive biology of Leach's Storm-Petrels on Saddle rock, Oregon Island National Wildlife Refuge. To date a total of 1,979 adults and 2,048 chicks have been banded. there have also been 65 recaptures of birds banded in previous years. Information is also being collected on food habitats.

Range Bayer is continuing his long term beached bird mortality transects north of Newport, Oregon and is co-authoring a paper on this subject.

Robert Loeffel is continuing his long term beached bird mortality transects south of Newport, Oregon and is co-authoring a paper on this subject. bob is now in the 13th year of data collection.

Thomas R. Howell will be presenting a paper at the IOC meeting in December entitled "Egg Size and Clutch Size In Some Charadriiformes" that deals largely with Pacific area terns. Thomas Howell is also collaborating with Hermann Rahn and Causey Whittow on a paper (in prep) that deals with the relationships between body size, egg size, clutch size, yolk size, incubation periods and fledging period in gulls and terns. They will be including all species for which they can obtain data.

SOUTHEAST, ROGER CLAPP

Robin Bjork and George Powell (National Audubon Society) are studying the effects of water-management activities in mangroves of the South Florida mainland which are the primary feeding grounds for Roseate Spoonbills breeding in Florida Bay. They are monitoring reproductive success and foraging distribution and are measuring physical factors such as salinity and water levels. They are also using radio-telemetry to study post-breeding

dispersal by both adults and juveniles. Their radio-telemetry studies also include investigations of habitat use, migration and re-nesting attempts by adult Great White Herons. One of their associates, Marilyn Spalding, is doing pathological analyses to determine causes of mortality in adult and juvenile wading birds.

Keith Bildstein (Winthrop College) is continuing long-term is continuing long-term studies of the reproductive success of White Ibises breeding on Pumpkinseed Island in coastal South Carolina. His present focus is examining the role of salt as a physiological constraint on the breeding ecology of this and other wading birds. He is also studying the effect that ibis predation has on fiddler crab populations in coastal salt marshes.

Brian Chapman has moved to the Department of Zoology, University of Oklahoma, Norman, OK 73019 (phone: (405) 325 - 5990) where he foresees little involvement with colonial waterbirds in the near future. He hopes to find time to publish the results of earlier work including surveys of Alacran Reef and a summary of ten years data on nesting by Sooty Terns along the Texas Coast.

Malcolm Coulter (Savannah River Ecology Laboratory of the University of Georgia) continues to study the breeding biology and foraging ecology of American Wood Storks of the Birdsville colony in east-central Georgia. He also continues his studies of breeding phenology of Blue-footed Boobies in the Galapagos Islands, Ecuador.

Julian Dusi is working on heron colony distribution and activity in Alabama. He is examining the effects of drought on Cattle Egret nesting and is trying to determine whether these egrets renest and what proportion of the population such birds may represent.

Michael Erwin (USFWS) is starting up an Earthwatch project on the Virginia barrier islands. This is part of the long-term ecological reserve program (NSF) conducted by the University of Virginia. It is a cooperative effort among the U.S. Fish and Wildlife SErvice, the Nature Conservancy, and the University of virginia. The study is to investigate wetland habitat use by shorebirds and wading birds. Both boat and aerial surveys will be conducted to document variations in habitat use from May to August.

Cameron and Kay Kepler (USFWS) are about to depart on a several-month long tour of the central Pacific islands aboard a relatively tiny yacht. They plan to make birds and plant surveys on many islands within the Phoenix and Line Islands including Flint Island, an island that has never received a thorough ornithological survey.

Kirke King (USFWS) is studying the levels and effects of environmental contaminants on egrets and herons in San Francisco Bay. He is also investigating the effects of contaminants associated with oil field waste water discharges. Such waste waters contain much metal and petroleum contaminants and are discharged directly into Texas estuaries. Wintering shorebirds in these coastal areas accumulate petroleum contaminants in their tissues to a level more than 24 times greater than arriving migrants.

Jim Kushlan (University of Mississippi) is currently working on short-legged, long-tailed submersible waders - i.e. alligators and crocodiles. He has recently written papers on population ecology and conservation of the American species and is completing a paper on the effects of hydrology on alligator reproductive success. For those who fear he has lost touch with birds completely, he is also working with James Hancock and Philip Kahl on a book of storks, ibises and spoonbills of the world.

Jim Parnell (University of North Carolina, Wilmington) is continuing colony surveys on the North Carolina coast and is in the final stages of editing on a North Carolina Sea Grant publication on the most recent surveys. He intends to begin some new research on growth and development of Brown Pelicans and will be continuing work on a colonial waterbird data base for North Carolina. Jim is also developing a microcomputer system for handling such survey data that should have wider applications. People interested in this system are invited to contact Parnell for details.

Tom Murphy and Philip Wilkenson (South Carolina Wildlife and Marine Resources Department), in conjunction with the Sea Grant Consortium, are conducting a survey of nesting seabirds and shorebirds in coastal South Carolina. They have just completed two years of survey and are currently writing up the results. Because of Hurricane Hugo they will do a follow-up survey in 1990 that will concentrate on the areas worst affected by the storm.

William Post (Charleston Museum) is continuing to census Double-crested Cormorant colonies inland in South Carolina. He is monitoring breeding success in one colony where some 80 nests ;were followed during 1989. Will is also conducting studies of the food fed the young to determine if cormorant food habits have an effect on local aquaculture. Preliminary results suggest they pose no threat.

Bill and Betty Robertson (Everglades National Park). Bill has just returned from the Virgin Islands where he was looking at the effects of Hurricane Hugo on the avifauna. He and Betty continue their long-term project on sooty Terns on the Dry Tortugas. They have been following individually marked birds over many seasons and have found that these terns tend to not form long-term pair bonds as many birds do not breed in successive years. Bird do, however, tend to pair with near neighbors of preceding seasons.

Jim Rodgers (Florida Game and Fresh Water Fish Commission) continues his studies of heavy metal and pesticide concentrations in Florida wading birds and the determination of buffer-zones necessary for protection of colonial waterbird colonies. 1990 will be the last season for data collection with a final report due in the fall.

Jeff Spendelow (USFWS) is coordinating a four-year study of the northeastern U.S. breeding population of the Roseate Tern. The third year of this cooperative study of population dynamics and habitat use at major colonies in Massachusetts, Connecticut and New York was completed in 1989. Approximately 1,200 adults have now been color-banded for individual identification and about 3,500 chicks have been banded and given a color band indicating their natal colony. Fledglings from all the major colony sites were seen at staging areas on Cape cod and some birds from colonies as far south as Connecticut were seen at staging sites in Maine.

Analyses of data from Falkner Island, Connecticut show that about 15% of the fledglings from that colony survive and return to nest there as breeding adults. At least one-third of the recruits at this colony were birds hatched elsewhere.

SOUTHERN CALIFORNIA, BETH FLINT FOR ZOE EPPLEY

San Diego Natural History Museum, Department of Birds and Mammals

William T. Everett is starting the second year of a study of Black Storm-petrel breeding biology on Los Islas Coronados, Baja California, Mexico. He is finishing a review (with Dan Anderson) of the status and conservation of Baja California and Gulf of California seabirds for the ICBP and working with the Mexican government to protect the breeding grounds of Townsend's Shearwaters.

University of California, San Diego - Scripps Institute of Oceanography

Gerald Kooyman recently returned from the Antarctic where he has been working on Emperor Penguins at Cape Washington. He is studying the feeding requirements and general natural history of this exceptionally large colony.

Don Croll is in the Antarctic working on Chinstrap Penguins at Seal Island. He is almost finished with his doctoral dissertation and will be taking a new job with the National Marine Fisheries Service in Seattle to continue working with John Bengston on habitat requirements of the penguins.

Southwest Fisheries Center, National Marine Fisheries Service

Bob Pitman and Steve Reilly, in collaboration with Lia Ballance of UCLA are studying flock composition and distribution of seabirds that forage over tuna-dolphin schools in the eastern tropical Pacific.

ERC Environmental, San Diego

Pat Mock has completed his doctoral defense and is continuing work on the energetics of growth in Thick-billed Murres. He and John Konecny are also studying the foraging behavior of Least Terns in Mission Bay and the effects of sand grain size on shorebirds foraging.

Camp Pendleton

Slader Buck is working with the California Least Tern management program on the base. This includes protection of nesting and feeding areas and monitoring of population and production as well as a banding project. In 1991 work is scheduled to begin on a project designed to enhance the wildlife value of the Santa Margarita River estuary.

Salton Sea

Robert McKernan is currently conducting long-term studies of waterbirds at the Salton Sea including overwintering biology of Podicipediformes, Pelecaniformes, Ciconiiformes, Anseriformes, and Charadriiformes. His collaborators in this work are Joe Jehl, Jr. and Michael McCrary. His is

also studying toxic loading in certain waterbird species through time series assessment at Salton Sea and staging and migratory waterbird use of the Salton Sea and the management and conservation of this resource.

University of California, Irvine

Zoe Eppley continues her research on ecological and phylogenetic variation in the development of Charadriiform birds. She is currently doing a second season of field work at Palmer Station, Antarctica on behavioral and developmental adaptations to cold in Kelp Gulls, skuas, and sheathbills.

Margaret Rubega is continuing her research on the biomechanics of feeding in Wilson's and Red-necked Phalaropes. She is preparing for a second field season at Mono Lake this summer.

George Hunt, Beth Flint, Mary Beth Decker, and Michele Miller are analyzing data gathered on reproductive energetics and foraging distributions of Pribilof Island seabirds. They have observed a decline in reproductive performance of St. Paul birds compared to that in the 1970's and are finding evidence of marked increases in foraging Short-tailed Shearwaters and baleen whales near the islands.

Dick Veit, with the help of Bob Russell, Peter Pyle, Oriane Williams, Dave Sibley, and Mike Lippsmeyer, is continuing a long-term study of variation in abundance of pelagic birds in the California Current system via the CALCOFI cruises.

David Irons has been deeply involved in studies assessing damages to seabirds done by the Exxon Valdez oil spill in Prince William Sound. He is also continuing his normal monitoring of Kittiwakes in Prince William Sound and his work on a PH.D. at UC Irvine.

Chris Elphick, visiting UC Irvine from the University of East Anglia, is doing an analysis of seabird feeding distributions in the Chirikof Basin of the northern Bering Sea during the 1984-1986 breeding season.

California State University, Long Beach

Charlie Collins plans to complete a summary of 20 years of Least Tern banding data and 10 years of Least Tern growth results this spring. He is also continuing work on a project studying adult survival of Least Terns at Camp Pendleton colonies.

Barbara Massey continues her long-term research on the California Least Tern with emphasis on the colonies at Camp Pendleton where she is working with Pat Baird, Charlie Collines, and Bill Schew. On the conservation front she continues to work as Co-chair of Pro Esteros, now collecting data to justify the creation of reserves at Estero de Punta Banda and Bahia de San Quintin.

Pat Herron Baird just finished a chapter on birds in "The Ecology of the Southern California Bight", a reference text to be published next spring. she is also continuing her research on population ecology of California Least Terns.

Kathy Keane continues monitoring the Least Terns at Terminal Island. Projects there include crow control and work with decoys to relocate the colony.
Los Angeles County Museum of Natural History.

Betty Anne Schreiber is continuing her work in the Central Pacific on Christmas and Johnston Islands studying populations, growth rates, longevity, pair bonds, and general breeding biology of the seabirds nesting there. She is doing a study of morphological variation in Pelecaniforms throughout the Pacific for which she needs skeletons. If anyone is collecting for other reasons, the museum would appreciate having the specimens.

University of California, Los Angeles

Bryan Obst continues his research concerning the energetics and digestive physiology of seabirds in Antarctica, Baja California, Northern Chile, and at Mono Lake.

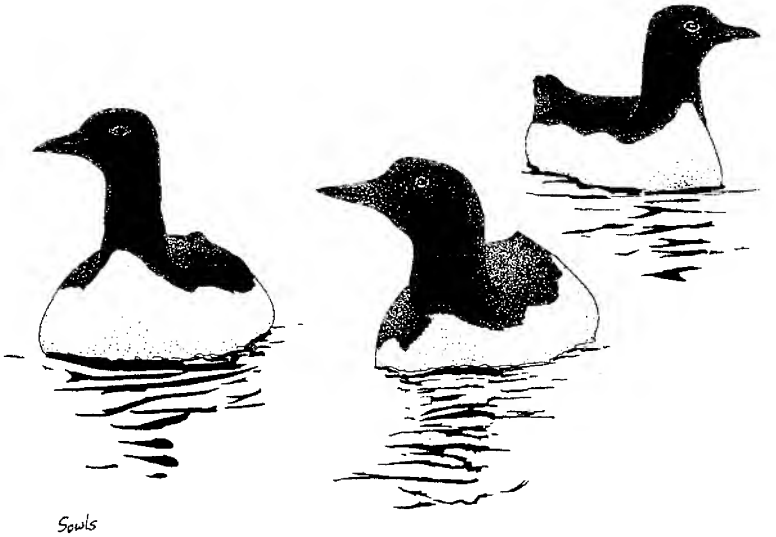
Lise Ballance is studying seabirds in the eastern tropical Pacific for her Ph.D. dissertation at UCLA. Her research, in conjunction with Bob Pitman and Steve Reilly of Southwest Fisheries Center, involves studies of community structure and flight energetics of seabirds which forage in flocks above schools of yellowfin and skipjack tuna and spotted and spinner dolphins.

California Status University - Fullerton

Bayard Brattstrom is continuing his studies in the Islas Revillagigedos, including an investigation of the repopulation of San Benedicto Island after Barcena Volcano erupted in 1952.

Channel Islands National Park - Ventura

Trudy Ingram is now working as the biologist in charge of seabird monitoring in the park.



REPORTS OF SOVIET PSG MEMBERS

Nikolai B. Konyukhov (USSR Ornithological Society, 1st Kotelnicheskii Per., 10, Moscow, 109240, USSR)

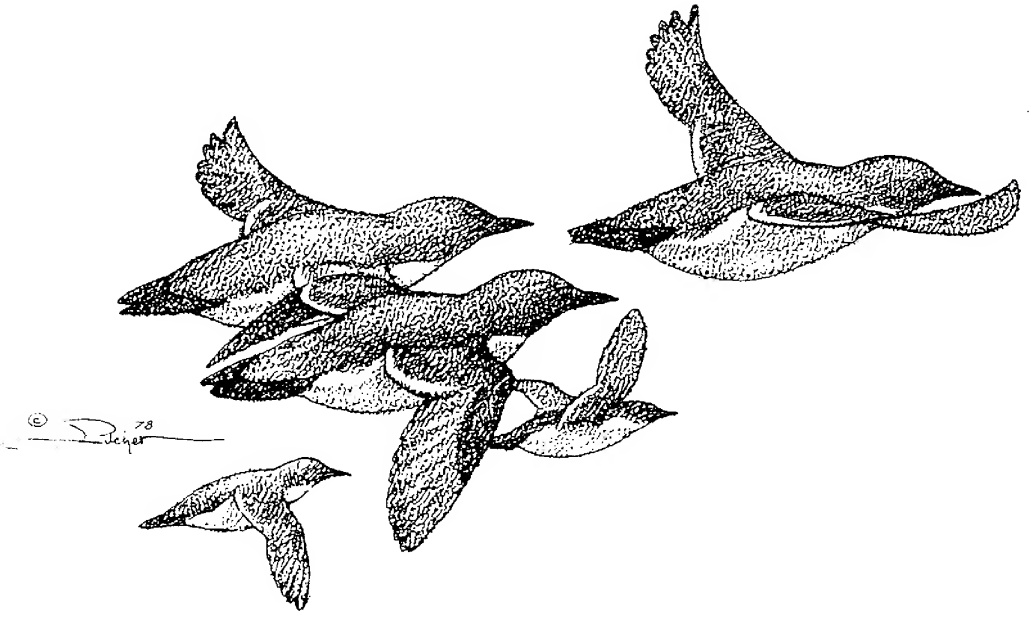
After surveying the coastlines of the Chukotsk Peninsula in 1985 and 1987, the seabird colonies located around Cape Ulyakhen were selected as sites for studies on alcid biology. During May to September 1988, I studied the nesting biology of Horned and Tufted Puffins, Crested and Parakeet Auklets. My research was centered on the relative activity of birds in relation to weather conditions and time of day, social behavior of birds in colonies, growth and development of chicks, diet, relation of activities to weather conditions, and study of the interactions between Tufted and Horned Puffins during nesting. this work will continue for the next few years.

Viktor A. Zubakin (USSR Ornithological Society, 1st Kotelnicheskii Per., 10, Moscow, 109240, USSR)

I have been conducting studies on the behavior, social organization, and nesting biology of Crested and Parakeet Auklets, Horned and Tufted Puffins, and Ancient Murrelets on Talan Island, Sea of Okhotsk. In 1988 and 1989, A. Y. Kondratiev, S. V. Tarkhov, S. P. Kharitonov, I. A. Kharitonova, and I conducted censuses of seabird colonies on Matykil Island, Yamskii Islands, and along the continental shores of Pyagina Peninsula, southwestern part of the Shelikhora Gulf, Sea of Okhotsk. In addition, I am continuing work on gull and tern colony behavior in the Sea of Azov.

S. P. Kharitonov (USSR Ornithological Society, 1st Kotelnicheskii Per., 10, Moscow, 109240, USSR)

I continue to work on the breeding of seabirds of Talan Island along with V. A. Zubakin and others. My interests are chiefly in understanding the role of signaling and courtship behavior and the development of colony structure. I have worked for the last two years on Wrangel Island on Snow Geese and have begun collaboration with USFWS biologists on several projects on these colonies.



SEABIRD NEWS

Atlas of the Breeding birds of Arabia

The Atlas of the Breeding irds of Arabia project commenced in 1985, with the aim of determining the status and distribution of over 200 bird species which breed within the Arabian Peninsula. Data gathering methods closely follow the widely used breeding evidence critetia of the European Ornithological Atlas Committee. There is no limit on the age of acceptable records. A periodic newsletter *The Phoenix* is provided free of charge to all contributors. As this newsletter is of general interest to all concerned with the birds of Arabia and the Middle East, non-contributors to the atlas may with to subscribe. Write to: Michael C. Jennings, Coordinator, Atlas of the breeding birds of Arabia, 1, Eastcourt, Burbage, Wiltshire, SN8 3AG, England.

News from Medmarvis

The Mediterranean Marine Bird Association has obtained funding from the EEC (subject t certain budget approvals) to compile and edit a manual entitled *Management techniques for island and coastal ecosystems in the Mediterranean: a practical manual for local and regional authorities and for park and reserve managers.* The Medmarvis secretariat is acting as a co-ordinating body for members of the group interested in obtaining funds from the EEC - a good example of advantages of a multinational group. Also reported is an approach to the World Bank to fund a Mediterranean Marine Wildlife Data Bank to enable monitoring of World Bank developments in the Mediterranean.

-- The Seabird Group Newsletter

SIBEN Expeditions to the Galapagos

In 1988, two expeditions from Guayaquil to the Galapagos Islands and through archipelago primarily to look for cetaceans, but the seabirds were also recorded. These expeditions were run from 1 - 18 October, 1988, and from 5 to 29 November, 1988. They were sponsored by the Long Term Research Institute based in Massachusetts, U.S.A. A list of the birds is available from Ben Haase, Observer and Collaborator of the Museo Ecuatoriano de Ciencias Naturales, Casilla 1440, Cuenca, Ecuador.

-- Malcolm C. Coulter

MONO LAKE

The struggle over water at California's Mono Lake has gone on for more than a decade. The area supports many waterbirds, including more than 100,000 Wilson's Phalaropes and 750,000 Eared Grebes during migration. Since 1941, water has been piped to Los Angeles. The water level has gone down for many years. At last there is good news concerning Mono Lake's water supply. Rush Creek, one of the main tributaries, now has water flowing down it to the lake. A court injunction ordered that the lake level be raised two feet from a current level of 6,375 feet. In addition, a new law was passed this fall that creates a $60 million Environmental Water Fund which has as a priority the funding of water and energy conservation in Los Angeles to help the city replace its Mono Basin water diversions. This will allow the city to save energy as well as help in the long term protection of Mono Lake.

-- Network News

OREGON AND NORTHERN CALIFORNIA

A. In 1987 the Minerals Management Service began a five-year national OCS oil and gas lease sale program for the Oregon and Washington PlANNING AREA (LEASE SALE #132). As currently proposed, this area would be offered for exploration in April 1992. During the period of 1985-1987, Oregon Governors Atiyeh and Goldschmidt provided comments to the Department of Interior during the preparation of the 1987-1992 lease sale program. Among other issues, the governors requested that a number of areas be deleted from lease sale consideration including:

1. Areas deeper that 200 meters, which is the edge of the continental shelf.

2. The Heceta-Stonewall Banks complex and Coquille Banks.

3. Six mile buffers around the rocks and islands of the Oregon Islands National Wildlife Refuge, the mouth of the Salmon River and Cascade Head Natural Research Area.

4. Six mile buffers around the mouths of coos Bay, Yaquina Bay, and the Columbia River.

Only areas deeper than 900 meters were actually deferred by MMS. All other requested deferral areas, which total about 900 square miles out of a planning area of 70,000 square miles, were "highlighted" for "special pre-sale considerations."

In March, 1988, Oregon joined a lawsuit with Washington, other states and environmental organizations to challenge the 1987-1992 OCS Lease Sale Program, in particular the adequacy of the EIS. The plaintiffs argued that the Secretary of Interior should have considered alternatives to offshore leasing such as energy conservation measures, that there was no criteria for determining which OCS areas were scheduled for leasing and which ones

weren't, that the leasing areas should have been based on geologic rationale, and that the EIS contained a flawed cost-benefit analysis that undervalued costs to many areas. The states lost almost every issue in federal court.

In January 1989, Secretary of the Interior Hodel agreed to establish the Pacific Northwest OCS Task Force composed of representatives of the Governors of Washington and Oregon, the Northwest Indian Fisheries Commission, the Columbia River Intertribal Fish Commission, and the Minerals Management Service. As a priority, the Task Force, through its technical and scientific committee, is coordinating development of a regional plan and strategy for environmental studies. Although various studies funded by MMS are underway it was obvious to the Task Force that results of some of these studies would not be available until after the leasing date and that additional studies were needed prior to the lease sale. In February 1990 the Task Force recommended to the Secretary of Interior that Lease Sale #132 be canceled and any leasing decision deferred until needed environmental studies are completed and the results analyzed. this may take seven to ten years. The Secretary has not yet announced his intentions.

B. Of great concern to researchers throughout the Pacific Northwest is the continuing harvest of Old-growth coastal forests and the impacts this may have on Marbled Murrelets and other resources dependent on this habitat. In California, five other initiatives to ban logging and preserve the remaining old-growth in private ownership have been introduced. These initiatives will be on the November ballot. Harvest of old-growth forest on public lands has already been reduced due to the continuing concern for the Northern Spotted Owl but some people feel that the harvest rate is still too high to provide along term protection to species such as the Marbled Murrelet. The State of California and the California State Legislature are moving cautiously toward limiting timber harvest of old-growth under the THP permit system requiring detailed wildlife inventories and mitigation in Northern California. There is continued resistance by the State of California to recognize any "endangered" status for the Marbled Murrelet even though recent reports funded partially by the state clearly demonstrated the high dependency of the murrelet upon old-growth redwood and mixed forests types in Northwest California.

The Outlook in Oregon is also questionable as researchers work just ahead of the chainsaws to document the life history and occurrence of Marbled Murrelets. This concern is well illustrated by Kim Nelson's 1990 Marbled murrelet study. Kim recently arrived at one of her study sites on the Alsea Ranger District of the Siuslaw National Forest only to find that the area had recently been clear-cut. Even without knowledge of specific nesting requirements, an interim management plan for habitat protection is needed. This is especially important since Northern Spotted Owl Conservation Areas do not protect all forest stands important to Marbled Murrelets.

C. Commercial sea urchin harvesting in Oregon continues to be a problem for breeding marine mammals and birds within Oregon Islands National Wildlife Refuge. This fishery, which employs two divers working from each boat, began in 1986 with a total harvest of 56,000 pounds. In 1989, the harvest exceeded 7.8 million pounds and the expected impacts to pinnipeds has not become obvious. Oregon Islands NWR protects almost all rocks, reefs and islands along the Oregon coast. The refuge includes only that area above mean high tide and does not include any of the surrounding waters. Since the State of

Oregon did not restrict urchin harvesting anywhere other than waters shallower than 10 feet, technically divers are legal when they anchor their boats literally feet from refuge rocks that are important marine mammal and bird breeding areas. This activity, close to northern sea lion pupping and haulout sites, is now causing major impacts and these sensitive animals are forced from their usual areas. Although the Fish and Wildlife Service believes that these fishermen are violating the Marine Mammals Protection Act and refuge regulations, enforcement is extremely difficult at the isolated Orford and Rogue Reefs.

During the past two years, !he number of adult animals at the Orford and Rogue Reefs have declined, unusual haulout patterns have been observed, and occasional complete abandonment of Orford Reef by sea lions has occurred. In 1989 one of the two traditional pupping rocks on Orford Reef was not used.

The Orford and Rogue Reefs constitute the largest breeding area for northern sea lions in U.S. water south of Alaska. Up until two years ago the Oregon population appeared to be stable while animals continued to decline in a major portion of the species range in Alaska and the Soviet Union. Because of the dramatic decline of the northern stocks, this species was declared a "threatened" species, range-wide by the National Marine Fisheries Service by emergency action on April 5, 1990. there is concern in Oregon that continued human activities near breeding and haulout sites may lead to long term declines here or abandonment of these important breeding areas. The Oregon Department of Fish and Wildlife is currently proposing seasonal urchin fishery closings around the Orford and Rogue Reefs. If adopted, this should help but does not eliminate other vessel traffic around the rocks. It is not a long term solution and is expected to result in urchin boats moving to other important marine mammal and bird sites along the coast resulting in disturbance impacts there.

-- Roy Lowe

PRO ESTEROS

Pro Esteros, the joint Mexican-US Organization working for the conservation of saltwater wetlands along the coast of the Sea of Cortez, has recently achieved non-profit, tax-exempt status. The organization has spent great effort over the last year to gather background information on Estero de Punta Banda. A proposal for reserve status for the area will be submitted shortly.

PUNTA SAN JUAN, PERU

Along the entire coast of Peru, the ocean is coldest and most productive near near the southern coast. Within an area less than 55 ha on the Punta San Juan, near the city of San Juan de Marcona over 50% of the Peruvian populations of Humboldt Penguins and South American Fur Seals breed. We are beginning to understand the importance of this peninsula from the work of Dra. Patricia Majluf. Because of its importance, this area is in need of protected status from the government. Dra. Majluf has requested that PSG members urge the Peruvian government to urge continued protection of this area. You may write to Sr. Juan Rebaza Carpio, Ministro de Pesqueria, Av. Paseo de la Republica 3101, Lima 27, Peru.

NEW PUBLICATIONS

Speich, S.M., and T.R. Wahl, 1989. *Catalog of Washington Seabird Colonies.* U.S. Fish and Wildlife Service Biological Report 88(6). 510 pp.

This is one of a series of publications describing seabird colonies of the marine shorelines of the United States produced by the U.S. Fish and Wildlife Service. Many people contributed to the information which is a thorough catalog. Copies may be obtained from Publications Unit, U.S. Fish and Wildlife Service, 18th and C Streets, N.W., Mail Stop 1111, Arlington, Square Building, Washington, D.C. 20240.

-- Malcolm C. Coulter

Birding, Volume 21, Number 1/2

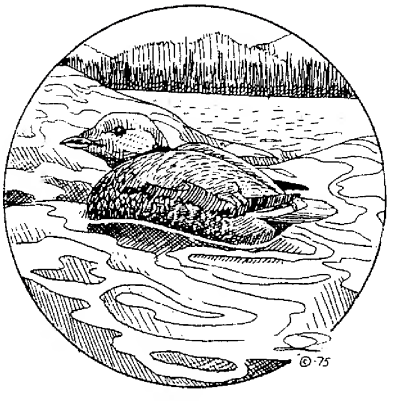
The American Birding Association is 20 years old. The twenty-first volume, number 1/2, contains many excellent articles on bird photography, including a nice article on photographing pelagic seabirds. The issue also includes technical information on bird photography. This volume may be obtained for $6.50 plus $2.50 first class or $1.25 book rate from the American Birder's Association Sales, P.O. Box 6599, colorado Springs, Colorado 80934-6599 or calling 1 - 800 - 634 - 7736.

-- Malcolm C. Coulter

Morrison, R.I.G., and R.K. Ross. 1989. *Atlas of Nearctic shorebirds on the coast of South America.* Canadian Wildlife Service. Volumes 1 and 2.

These atlases are the result of five years (1982-1986) of surveys of over 28,000 km of coastal wetlands in South America. It was a joint effort involving representatives of most South American governments, many volunteers as well as many North American government and non-government Organizations. It contains a tremendous amount of information. The first volume deals with the distribution of individual species; the second volume deals with the coastal wetlands. These volumes are available from the Canadian Wildlife Service, National Wildlife Research Centre, 100 Gamelin Boulevard, Hull, Quebec, Canada K1A OH3.

-- Malcolm C. Coulter



BULLETIN BOARD

Books for Nature

Books for Nature is a grass roots organization which sends field guides, technical literature, and basic field research equipment to libraries, teachers and field biologists in developing countries. Our goal is to encourage the growth of conservation biology as a science and an ethic by increasing knowledge of the natural world.

We try to get our books and field equipment for free or at considerable discounts and send them to where they are needed with visiting researchers, or by post. If you would like to donate money, books, journals, or basic field research equipment please send them to: Books for Nature, c/o Bernie Tershy, Neurobiology and Behavior, Seeley G. Mud Hall, Cornell University, Ithaca, N.Y. 14853 (please contact us by letter before sending more than one box of materials). We would also like to hear from researchers who have contacts with needy institutions and can deliver materials directly.

Two Seabird Positions Available

We are looking for two people to conduct seabird censuses during a marine mammal survey cruise in the eastern and central tropical Pacific from 28 July - 6 December 1990. Experience with seabird census techniques, computer literacy and biology background will be given preference. Long hours, small pay, inports: depart San Diego, California; Hilo, Hawaii, Punta Arenas, Costa Rica; Lima, Peru; San Diego. Contact: Lisa Ballance, Southwest Fisheries Center, P.O. Box 271, La Jolla, CA 92038; Telephone (619) 546 - 7173.

Sowls